

A RAND NOTE

Proceedings of a Colloquium on Total Force Management

**Glenn A. Gotz, Chair
Robert M. Brown, Rapporteur**

RAND

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 1991		2. REPORT TYPE		3. DATES COVERED 00-00-1991 to 00-00-1991	
4. TITLE AND SUBTITLE Proceedings of a Colloquium on Total Force Management				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rand Corporation, 1776 Main Street, PO Box 2138, Santa Monica, CA, 90407-2138				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 152	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

The research described in this report was sponsored by the Assistant Secretary of Defense (Force Management and Personnel) under RAND's National Defense Research Institute, a federally funded research and development center supported by the Office of the Secretary of Defense and the Joint Staff, Contract No. MDA903-90-C-0004.

The RAND Publication Series: The Report is the principal publication documenting and transmitting RAND's major research findings and final research results. The RAND Note reports other outputs of sponsored research for general distribution. Publications of RAND do not necessarily reflect the opinions or policies of the sponsors of RAND research.

A RAND NOTE

N-3110-FMP

**Proceedings of a Colloquium on
Total Force Management**

**Glenn A. Gotz, Chair
Robert M. Brown, Rapporteur**

**Prepared for the
Assistant Secretary of Defense
(Force Management and Personnel)**

RAND

Approved for public release; distribution unlimited

PREFACE

At the request of the Office of the Assistant Secretary of Defense (Force Management and Personnel) and the Office of the Assistant Secretary of Defense (Reserve Affairs), RAND's Defense Manpower Research Center hosted a colloquium on Total Force Management on September 27-28, 1989. The Defense Manpower Research Center is part of the National Defense Research Institute (NDRI), a federally funded research and development center sponsored by the Office of the Secretary of Defense and the Joint Staff.

The purpose of the colloquium was to bring together a number of the parties who conduct, sponsor, or use defense manpower research and to develop a research agenda that addresses important issues related to management of the total military force. It was attended by representatives from all branches of the services, the Office of the Secretary of Defense, and six federally funded research and development centers: the Logistics Management Institute, the Institute for Defense Analyses, the Center for Naval Analyses, and RAND's NDRI, Project AIR FORCE, and Arroyo Center.

This Note summarizes presentations given by individuals, discussions following those presentations, and workshop sessions. The views expressed by all participants do not necessarily reflect the views of RAND.

These proceedings should be of interest to officials who establish defense manpower policies, to individuals within OSD and the services who implement manpower policies, and to analysts who study aspects of defense manpower.

ACKNOWLEDGMENTS

Karen Alderman and Larry Lacy of the Office of the Assistant Secretary of Defense (Force Management and Personnel) helped to organize the colloquium. The presenters at the colloquium gave informative and insightful talks, and the attendees participated fully in the spirit of the colloquium by exchanging ideas in a candid and constructive manner. RAND reviewer Warren Walker provided useful suggestions for improving the presentation of this Note.

CONTENTS

PREFACE	iii
ACKNOWLEDGMENTS	v
FIGURES AND TABLES	xi
GLOSSARY	xiii
Section	
I. INTRODUCTION	1
II. TOTAL FORCE POLICY: THE PROPOSED DIRECTIVE	
by Karen Alderman	3
Definition	3
Background	3
Progress to Date	4
Conceptual Framework	5
Major Issues	5
Key Elements of the Proposed Total Force Policy	7
Follow-up Actions	10
Discussion	11
III. CONTEMPORARY RESERVE FORCE ISSUES	
by Brigadier General Carl R. Morin, Jr.	13
Issues Facing the Reserve Community	13
Criteria for Prioritizing Research	17
Discussion	19
IV. TOTAL FORCE COMPOSITION—IMPROVING THE FORCE-MIX MANAGEMENT PROCESS	
by Don Srull	21
Objectives and Scope	21
Findings	22
Recommendations to Improve the Force-Mix Management Process	23
Technical Issues	23
Discussion	26
V. THE ANALYTIC TREATMENT OF RESERVE POLICY ISSUES	
by Stanley A. Horowitz	27
Objectives	27
An Idealized Analytic Structure	27
Oversight of Reserve Policymaking	28
Making Reserve Policy	29
Conclusions	31
Recommendations	32
Discussion	33

VI.	DEVELOPING COST-EFFECTIVENESS GUIDELINES FOR TOTAL FORCE MANAGEMENT	
	by Adele Palmer	34
	Background	34
	Goals of the Current Study	35
	Decisionmaking Modes: Planning and Programming/Budgeting	35
	The Basic Model	36
	Four Life Cycles	36
	Life Cycle Calculations	37
	Objective Functions—Two Management Principles	38
	Net Cost-Effectiveness Analysis	38
	The Case for Extra Active Forces	39
	Dual-Usage Scenarios	41
	The Case for Revised Guidelines	42
	Conclusions	43
VII.	ENHANCING THE MEASUREMENT OF READINESS AND SUSTAINABILITY	
	by S. Craig Moore	45
	Current Measurements Are Inadequate	45
	Developing an Integrated System	46
	Improving Assessment Methods	48
VIII.	OPERATIONAL TRAINING AND PERFORMANCE OF COMBAT UNITS	
	by Glenn A. Gotz	50
	Policy Issues	50
	Scope of the Research Literature	50
	Findings from the Literature	51
	Methodological Limitations of Past Research	52
	Viewing Training Resources Broadly	53
	Conclusions	53
	Discussion	55
IX.	RELATING FLYING HOUR ACTIVITY TO INDICATORS OF OPERATIONAL PERFORMANCE	
	by Stanley A. Horowitz	58
	Navy Carrier Landings	59
	Analysis of Marine Corps Bombing Accuracy	60
	Analysis of Navy Air-to-Air Mission	61
	Conclusions	62
	Discussion	63
X.	FORCES, READINESS, AND MANPOWER INFORMATION SYSTEM (FORMIS)	
	by Colin Halvorson	65
	Developing a Prototype System	65
	FORMIS Architecture	66

FORMIS Objectives and Capabilities	67
Implementation and Evolution	69
Discussion	70
XI. PERCEIVED CONSTRAINTS TO UNIT READINESS: EVIDENCE FROM THE 1986 SURVEY OF RESERVE FORCES	
by David Grissmer	72
Objectives	72
Approach	72
Preliminary Findings	75
Policy Issues	78
Discussion	80
XII. THE TRAINING STATE OF ARMY COMBAT SERVICE SUPPORT UNITS	
by John Metzko	81
Objective, Scope, and Methodology	81
Training Shortcomings Cited by Commanders	81
Length of Time to Achieve Readiness	82
Active Versus Reserve Costs	82
Savings Could Be Used to Improve Readiness	83
Discussion	84
XIII. RESERVE COMPONENT COMBAT SERVICE SUPPORT TRAINING STRATEGY	
by Ed Simms	85
Scope	85
Key Differences Between Active and Reserve Training Environments	86
Problems with Replicating the Active Training Strategy	88
Conclusions	89
Recommendations	89
Discussion	91
XIV. IDA DEFENSE PLANNING MODEL	
by Phil Gould	93
Background	93
Key Features of the Defense Planning Model	93
Features of the Cost Model	95
Limitations and Strengths	96
Discussion	97
XV. RAND'S RESEARCH ON ESTIMATING THE COSTS OF TOTAL FORCE MIX DECISIONS	
by Glenn A. Gotz	99
The Environment for Costing in the PPBS	99
A Structured Approach to Active/Reserve Costing	100
DoD Cost Factors	102
Personnel Costing	103
Additional Research Required	103
Discussion	105

XVI.	TRANSFERRING ACTIVE FORCES TO THE RESERVES	
	by Lane Pierrot	108
	Congressional Interest	108
	Broad Issues in Constructing Transfers	109
	Estimating Savings	110
	Capability	111
	Potential Show Stoppers: Operational Considerations	112
	Summary	113
	Discussion	114
XVII.	LINKING NATIONAL SECURITY OBJECTIVES AND TOTAL FORCE MANAGEMENT	
	by David Chu	115
	Viewing Total Force as a Continuum	115
	Seeking Solutions to Impending Problems	117
XVIII.	SUMMARIES OF GROUP DISCUSSIONS	119
	Linking Defense Strategy to Total Force Composition Decisions	119
	Research to Assist Implementation of Total Force Policy	120
	Capability Assessment Tools: What Needs to Be Done?	121
XIX.	SUMMATION	124
	BIBLIOGRAPHY	127
	Appendix	
	A. AGENDA	129
	B. LIST OF ATTENDEES	131

FIGURES

1.	Total force overview	6
2.	A framework for tying reserve component issues to national strategy	28
3.	Four life cycles	37
4.	The case for extra active forces in a Case C POF.	40
5.	Guidelines by goal region for cost category two	43
6.	Strategic concept: an integrated R&S assessment framework	47
7.	Profiles of estimated operational activity levels	48
8.	FORMIS architecture: data files.	66
9.	FORMIS architecture: analysis modules and DMDC data files	67
10.	Air Force Reserve: serious problem mention (E-6)	76
11.	Naval Reserve: serious problem mention (E-6).	77
12.	IDA defense planning model	94

TABLES

1.	Logistics skills manpower total force mix.	85
2.	Training strategies: Army active versus reserve	88

GLOSSARY

ASD	Assistant Secretary of Defense
CINC	Commander in Chief
CBO	Congressional Budget Office
CONUS	Continental United States
CSS	Combat service support
DG	Defense Guidance
DMDC	Defense Manpower Data Center
DoD	Department of Defense
DOS	Days of supply
FFRDC	Federally funded research and development center
FM&P	ASD (Force Management and Personnel)
FORMIS	Forces, Readiness, and Manpower Information System
FORSCOM	U.S. Forces Command
FY	Fiscal year
FYDP	Five-Year Defense Program
GAO	General Accounting Office
IDA	Institute for Defense Analyses
IG	Inspector General
IRR	Individual Ready Reserve
JCS	Joint Chiefs of Staff
JS	Joint Staff
LMI	Logistics Management Institute
MOS	Military Occupational Specialty
MSO	Minimum service obligation
MTO	Mid-Term Objectives
OASD	Office of the Assistant Secretary of Defense
O&M	Operations and maintenance
O&S	Operations and support
OJE	On-the-job experience
OJT	On-the-job training
OMB	Office of Management and Budget
Optempo	Operating tempo
NPS	Nonprior service reservist
NTC	National Training Center
OSD	Office of the Secretary of Defense
PA&E	ASD (Program Analysis and Evaluation)
POF	Part of force
POM	Program Objective Memorandum
PPBS	Planning, Programming, and Budgeting System
RA	ASD (Reserve Affairs)
RCCPDS	Reserve Components Common Personnel Data System
RUPS	Reserve Unit Priority System

SORTS	Status of Resources and Training System
TOA	Total obligational authority
TO&E	Table of organization and equipment
USA	United States Army
USAF	United States Air Force
USD	Under Secretary of Defense
USD(P)	Under Secretary of Defense for Policy
USMC	United States Marine Corps
USN	United States Navy

I. INTRODUCTION

In 1973, the Department of Defense (DoD) adopted a "total force policy," which stipulated that all elements of the force structure—including not only active and reserve components, but also civil servants in the DoD, civilian contractors, and retired military personnel—should be considered concurrently in developing military capability in support of national security objectives. In essence, the total force policy states that missions should be given to whichever component can achieve them most economically. The intent of the policy is to make better use of the reserve components and to save money by shifting some of the functions formerly performed solely by active units to the reserves and other personnel.

This policy differs significantly from previous practice, which relied almost exclusively on the active components for all early deployment missions, support as well as combat. Much of the focus of the policy, and much of the debate and research, has been on the use of Guard and Reserve units. Instead of being seen as units to be held until needed in a major contingency, they would become integral parts of a total force structure.

For various reasons, including lack of guidance, definition, and incentive, the total force policy has not been implemented completely or consistently by the Services. Although the reserves have grown and have assumed an increasing role in the total force, many questions remain regarding the policy and its implementation. Since one of the primary reasons for shifting missions into the reserve components is to save money during a period of limited resources, the two most basic questions have been: How significant are the savings? How much capability will be lost? In addition, there is a series of related questions as to what responsibilities the reserve components should assume, what the active/reserve/civilian mix should be, how decisions should be made regarding that mix, whether it is possible to determine a minimum force, what should be done with active units whose functions are given to reserve units, how reserve personnel should be trained, which methodologies should be used to measure the readiness status of reserve units, and how savings are to be measured when shifts from the active to the reserve components are made.

The colloquium divided these topics in four broad areas:

- Linking national defense strategy to total force composition decisions.
- Developing information that allows for cost-effective allocation of defense functions among active, reserve, and civilian components.
- Identifying constraints on allowable mixes of the three categories of personnel.
- Improving OSD and Service procedures for total force management.

The colloquium had three objectives in bringing together many of the actors in the total force issue: to review recent analytic studies on total forces, to provoke discussion on key issues and provide varied perspectives, and to highlight issues that have received inadequate research attention.

The format of the colloquium was a series of briefings, followed by question-and-answer periods. The OASD (FM&P) perspective was given in a briefing on a proposed new directive on total force policy, and the OASD (RA) perspective was given in a briefing outlining reserve force issues. A somewhat different perspective was given by a representative from the Congressional Budget Office. The remaining dozen presentations were given by researchers from the three OSD-sponsored federally funded research and development centers: Logistics Management Institute, Institute for Defense Analyses, and RAND's National Defense Research Institute. At the end of the colloquium, participants divided into four working groups, each of which addressed a broad total-force issue. The colloquium then reconvened, and each working group reported themes and issues needing additional work to promote an improved total force policy. The goals of determining the focus for future research efforts and helping to map out and prioritize a research agenda were therefore accomplished by the participants.

Finally, we should note that there is some variation between the presentations given at the colloquium and the descriptions of those presentations in this Note. Since the discourses here are summaries, they omit much of the detail and richness of the briefings. Also, the structure of the summaries does not always follow that of the briefings because a structure that is effective in one medium is not always equally effective in another. Finally, in some cases where discussion interrupted the speaker's presentation, his or her responses to questions are incorporated into the summary instead of being placed in the discussion section that follows it.

II. TOTAL FORCE POLICY: THE PROPOSED DIRECTIVE

**Karen Alderman, Director of Productivity and Civilian Requirements,
DASD Resource Management and Support, OASD (FM&P)**

The purpose of this presentation is to explain the key elements of a proposed total force policy directive, which a working group within the Department of Defense recently drafted. The talk covers the definition of total force, the background of the total force policy, the progress to date on the directive, the major issues that have surfaced, the key attributes of the proposed total force policy, the responsibilities assigned to OSD and the Services, and the tasks still to be accomplished on the policy. The basic aim of the policy is to achieve a cost-effective total force mix.

DEFINITION

Different organizations use the term *total force policy* to mean different things. The Reserve Forces Policy Board, for example, defines total force policy as simply the active-reserve mix. The official definition, and the one proposed in the Directive, is: "Our total force comprises the organizations, units, and personnel that constitute the Defense Department's manpower resources" (from the *Annual Report to Congress*). These manpower resources include not only the full range of military manpower—active, reserve, and retired military personnel—but also DoD civilians, DoD contractors, and host-nation support. This is clearly much more comprehensive a definition than just the active-reserve mix.

BACKGROUND

DoD is developing a directive because, even though the total force policy was proclaimed in 1973 with the transition to the all-volunteer force, implementation of the policy across the Services has varied. The main reason for the variation was that there was no *standardized* DoD total force policy. Nor were there criteria for decisionmaking, since no accompanying directive or set of instructions was issued. In essence, the policy was proclaimed but was not described in any detail. In fact, the most current DoD directive covering manpower mix was issued in 1954.

In addition to recognizing the internal need to clarify the total force policy, DoD has been under pressure from Congress to present an integrated policy on total force. Many members of Congress have the impression that DoD does not have a credible total force policy to ensure a cost-effective force mix. The chief advocate in the Senate for defining total force policy has been Senator John Glenn, who has for some time been critical of our apparent inability to articulate a policy: "It has become painfully clear that the total force policy in the Department of Defense needs to be more clearly and rationally defined. . . . We could not get definitive answers either from DoD or the Service witnesses on the chain of responsibility for evaluating and integrating active force and reserve force requirements" (from a letter to the Secretary of Defense, August 1, 1988). In a hearing before the Senate Armed Services Committee, Senator Glenn stated that "we have never consciously and carefully reviewed our total force policy. . . . I feel that a full-fledged reassessment of our total force policy is long overdue, and should be initiated immediately." (May 3, 1989).

In response to these concerns, both the House and the Senate Armed Services Committees have mandated in this year's authorization bill a review of total force policy. The Senate version mandates studies to review basic tenets of total force policy, determine what changes are needed in the total force mix in each Service, assess combat readiness shortfalls, and stipulate resources required to correct the shortfalls that are identified. It goes on to state that DoD should develop a force mix strategy for dealing with a substantially smaller active force and develop a system for top-level evaluation of force mix decisions. The House version is even more detailed. It requires a review of methodology for assigning missions and for distributing force reductions between the active and reserve components, and it mandates that DoD analyze the factors that are considered in determining force structures, including response time, equipment distribution, training time and cost, personnel availability, and cost-benefit analyses. These are examples of the kinds of detailed reporting we will be required to perform as a result of this year's authorization bill. This colloquium, therefore, is a timely one.

PROGRESS TO DATE

In April 1988, after a series of Service and Joint Staff briefings on how force mix decisions were made during the period of 1980 to 1988, the Assistant Secretary of Defense (FM&P) formed a working group to develop policy on total force. From May

1988 to May 1989, the team, which consisted of representatives from various OSD offices and later from the Joint Staff and the Services, developed a draft of a total force policy directive. The draft has undergone numerous iterations, and although the basic elements are reasonably complete, there will still likely be revisions. Aspects of the directive have been briefed to the senior people in the Joint Staff and officials in the new administration, and it has been received reasonably well. The draft directive has been staffed for issuance, and it is now ready for the final senior-level review.

CONCEPTUAL FRAMEWORK

The construct for the total force directive, shown in Fig. 1, is a linking of threat to national strategy in terms of specific defense capabilities. These must be articulated in terms of both mobilized and nonmobilized contingency requirements, and in doing so we should also consider Allied capabilities and acceptable risks. On the constraint side, the force mix and the policy will have to realistically consider the fiscal limitation that DoD will be operating under, as well as political and legislative parameters. Manpower must be designed to meet the threat with implementing factors considered, including force posture and levels of the force structure, current and future weapon systems, personnel systems (which affect cost), and manpower mix decision rules.

MAJOR ISSUES

During the total force policy working group's discussions, a number of important deficiencies surfaced concerning the way DoD currently reaches decisions about total force; defining those problems helped to suggest the elements that a total force policy should incorporate. The major issues are as follows:

- **Lack of nonmobilized contingency planning.** Planning guidance and evaluation tools fail to consider nonmobilized contingency planning as part of the basic framework of force mix. Defense planning guidance criteria in the past assumed mobilized scenarios only, and that resulted in incomplete evaluation of reserve-active mix. In the last 40 years, however, almost all U.S. engagements have been nonmobilized contingencies.
- **Lack of active/reserve integration among Service plans.** There are serious disconnects across the Services in active/reserve mix planning. For

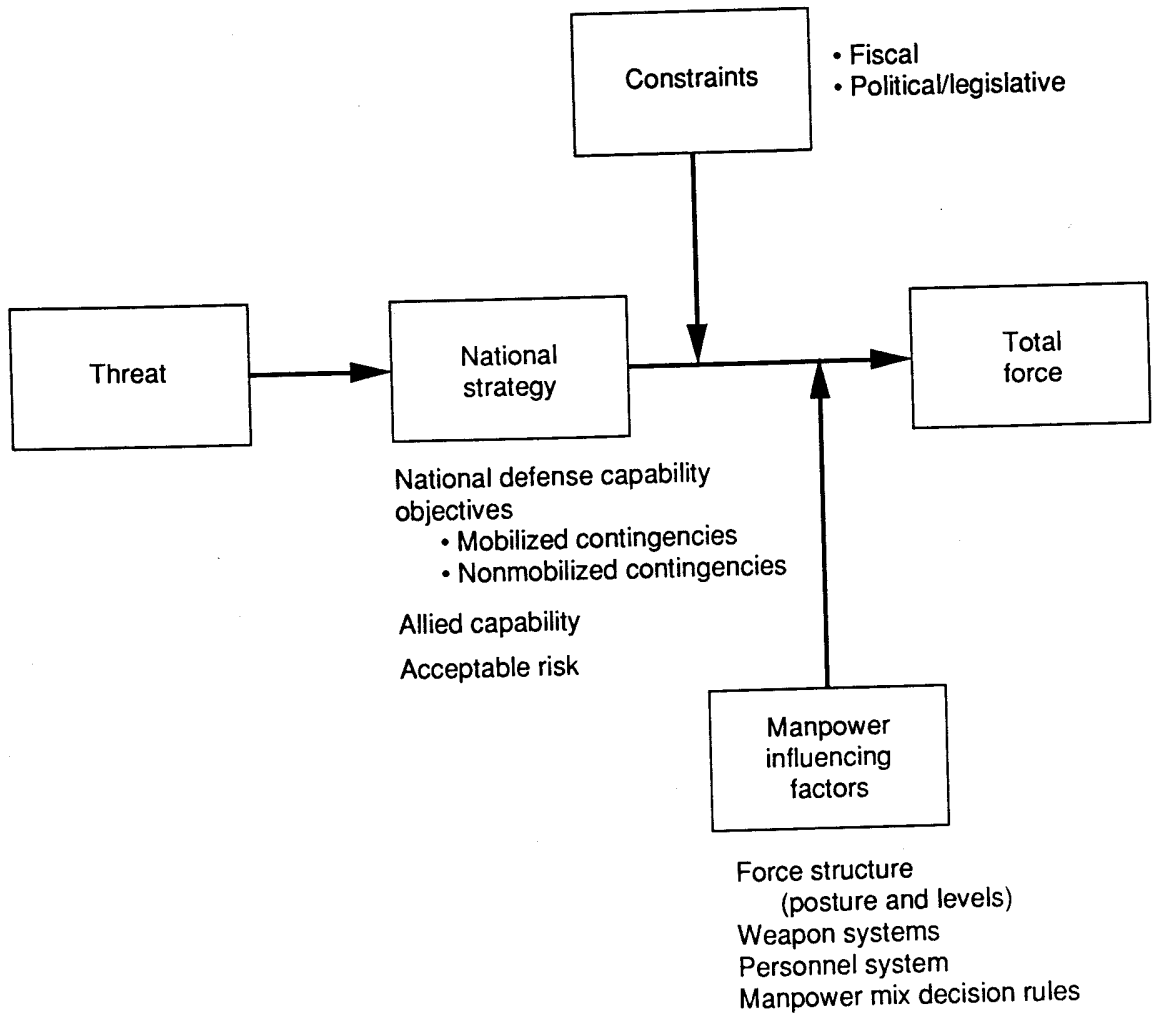


Fig. 1—Total force overview

example, the Marine Corps' amphibious force is ready for deployment, but most of the Navy logistics needed to support those forces are in the reserves.

- **Planning without fiscal constraints.** In the past, DoD has made plans without realistic fiscal constraints, and this practice allowed us to delay many force-mix and other decisions. Under the Goldwater-Nichols Act, the connection between the funds available and the planning will have to be much more closely aligned.

- **Manpower mix not tailored to threat.** The tools and techniques that would allow tailoring of forces to threat in an analytic fashion have not existed within DoD. Most of the major analytic tools, such as the large models used by the Joint Staff and the Army, assumed mobilization in their evaluation.
- **Personnel policies not clearly linked to total force objectives.** In personnel administration, we offer force models as a proxy for manpower requirements, and some of those proxies are not as good as others. Some alignment exists for military personnel, but the discipline with linking requirements and personnel administration management policies has been inadequate. In the civilian personnel administration world, the linkage seldom occurred.
- **No common DoD language or set of criteria for evaluating force mix.** For example, "manpower authorization" can denote entirely different meanings to different communities, and even across the Services there was significant variation in meaning.
- **Lack of clear responsibility for total force policy definition and implementation.** No single office can be in charge of total force policy; the responsibility must be shared by the Joint Staff, the Services, and the various OSD offices. In the past, however, the linkages among these players have not been well defined.
- **No regularly scheduled, in-depth review of overall total force policy implementation.** There must be periodic reviews of how the policy is being implemented; otherwise, there is no check on the impact of incremental changes on long-term objectives.

KEY ELEMENTS OF THE PROPOSED TOTAL FORCE POLICY

To address these issues, the working group outlined what it considers to be the main elements that a total force policy should incorporate. The first element is an agreed-upon objective. The stated objective of the draft total force policy is to achieve a cost-effective total force mix. This requires establishing links between threat, national strategy, national defense capability objectives (for both mobilized and nonmobilized contingencies), fiscal constraints, and total force manpower. The proposed policy draws

linkages among national intelligence estimates, defense planning guidance, contingency planning guidance, and Joint Staff and Service plans. By coordinating policy guidance, we ensure consistent use of assumptions in allocating manpower and resources. Achieving the objective of a cost-effective total force mix also requires use of standardized DoD total force evaluation criteria and definitions. To that end, the Joint Staff has been preparing and maintaining a dictionary of terms with standardized definitions.

Manpower Decision Rules

The guidance describes a consistent set of manpower decision rules to ensure appropriate and cost-effective use of different types of manpower. The basic policy is to maintain the minimum force necessary to meet the requirements. According to this guidance, military personnel are to be used for combat readiness, training, security, discipline, rotation base, law, and cost advantage. DoD civilians—people who are direct government employees—are to be used for nonmilitary governmental functions, cost advantage, and mobilization requirements. DoD contractors are to be used for nongovernmental functions and cost advantage. If a function does not have to be performed by the military, it should be done by a civilian, and whether it is an in-house civilian or a contractor is largely a function of cost advantage. Finally, the rules state that host-nation support should be used as specified in international treaties and agreements. Where there is potential in an Allied setting for another nation to take a function in the operating plans for that nation's defense, we should use that nation's support.

The policy further requires consistent application of active/reserve mix criteria to ensure that appropriate functions are assigned to the right components. The manpower decision rules for the active/reserve mix state that the active component should be used for overseas forward deployment and other duty requiring immediate response capability; for CONUS rotation base for overseas and ship-to-shore assignments; for military missions that require intensive training, highly technical or military-unique skills, and high peacetime tempo or readiness; and for immediate deployment without voluntary or involuntary call-up of the reserve component personnel. The reserve component, then, is to be used when active component personnel are not required; when reserve component personnel can be available to meet deployment schedules for a mobilization; and when they are cost effective.

Another aspect of the proposed policy concerns how to set personnel administration policy. The directive requires personnel policies to cost-effectively support total force requirements.

Costing Methodologies

In looking at past decisions of whether something should be military or civilian, active or reserve, we discovered that costing issues were often problematic. Discussions often never progressed beyond methodology because different organizations used different methodologies and therefore had different figures. In these cases, the real issue never gets discussed. Therefore, there is a strong need to develop *standardized* evaluation and costing methodology across the board.

Responsibilities Assigned

The policy requires clear assignment of responsibilities among OSD and the Services' offices. According to the proposed policy, the ASD (FM&P) prepares the total force DoD directive and DoD instructions, chairs the Conventional Forces Readiness Committee, and is responsible for manpower and personnel policy. The USD (Policy), in coordination with the Joint Staff, develops national defense capability objectives for mobilized and nonmobilized contingencies and provides consistent assumptions as to threat, warning time, and allied capabilities. With conventional forces reduction treaties underway, the issues of threat and warning time are under particular debate because if an immediate response time is not needed, there is more opportunity to withdraw forward-deployed forces, and more opportunity to put selected forces into the reserves.

To ASD (PA&E) is assigned the responsibility for preparing standardized evaluation and costing methodology. ASD (Reserve Affairs) is responsible for ensuring that Reserve Affairs policies and plans support total force policy objectives. The Joint Staff's major responsibilities are to (1) evaluate force mix plans and assess risks associated with alternative force mix options and (2) review CINC plans for consistency with *Defense Planning Guidance* and *Contingency Planning Guidance* policies and assumptions, as required by the Goldwater-Nichols Act. Finally, the military Services have the responsibility of implementing the total force policy. They are the ones who have the major responsibility of shaping plans to fit policy, though it is the Joint Staff responsibility to ensure policy implementation across the Services.

The last element of the total force policy is a requirement for a quadrennial review of total force mix, policies, and methodologies.

FOLLOW-UP ACTIONS

The next steps will be to publish the total force policy directive, develop and publish a DoD instruction, and develop additional analytic tools, especially standardized evaluation and costing methodologies. Finally, we need to establish something akin to a quadrennial review of total force policy, including manpower mix, methodologies, and implementing instructions.

There is a consensus that a crystallization of total force policy is needed, and we think we are coming close to providing that policy.

DISCUSSION

It was noted that there has been considerable disagreement as the directive was being drafted, that the directive represents long negotiations, and that there are still some issues that need resolution. Reserve Affairs in particular did not totally agree with the directive with respect to the responsibilities, the consideration of the reserves, and nonmobilized contingencies. On these issues, total closure is still to be achieved.

The role of military retirees came up as an issue for consideration. It was pointed out that the directive has an entire section devoted to that group, and it includes decision rules about retirees.

The status of and schedule for the directive were also addressed. Once the Secretary of Defense confirms the schedule, there will be movement on the directive. It has been staffed but will formally be staffed again.

One of the recurring topics following the presentation was cost-effectiveness. It was suggested, for example, that one aspect of the policy debate needing more attention is the effectiveness side. Although people argue about the cost, they are most concerned that cost will drive options and will define the level of effectiveness. Many of the arguments about cost, therefore, are actually about differences in perceptions of how much effectiveness we will have. People do not want to lose flexibility or options. There will be more opportunity to fix the costing side if it is recognized what the real issue is on the other side.

The definition of cost-effectiveness was another issue. DoD can either define cost-effectiveness in one way and draw conclusions based on that, or it can acknowledge that the concept can be defined in a variety of ways, which DoD will then explore. The former method was suggested as having greater promise because it encourages uniformity and provides a starting point for improvement.

Another issue discussed was the congressional requirements for a DoD report. The point was made that the report will not solve all the research agenda issues because research needs are much longer-term issues. Reference to that report was simply to note that a marker has been set, not just to solve internal issues, but also to report externally.

Decision rules were also discussed. The big debate that has been going on for the last decade on how to manage total force and on decision rules and ways to optimize the force was driven by the question of whether defense expenditures can be reduced by

more effective use of the total force. Because spending is now decreasing, the question has become: Are there careful and responsible ways this can be done?

III. CONTEMPORARY RESERVE FORCE ISSUES

Brigadier General Carl R. Morin, Jr.
DASD Readiness and Training, OASD Reserve Affairs

Two subjects are reviewed in this talk: first, the key issues facing the reserve community today, and second, criteria for prioritizing studies for the federally funded research and development centers.

ISSUES FACING THE RESERVE COMMUNITY

"Weekend Warrior" Misperception. One of the major issues concerning the reserve community today is a basic lack of current knowledge about the reserve components. Many people continue to think of reserves as they once were, though anyone who thinks of reserve components as America's "weekend warriors" is at least a decade behind the times. Such a perception colors all discussion of other key issues—from force mix to funding—as well as the debate about what the reserves can and cannot do.

The modern-day reserve component has changed substantially. For example, the ready reserve has increased by 350,000, and the quality of the people in the reserve forces is as improved as that of the active forces. The IRR (Individual Ready Reserve) has grown to 485,000 and is estimated to go to 700,000 because of the eight-year MSO (minimum service obligation). Furthermore, over \$45 billion of equipment (new or redistributed) has gone to the reserve components since 1980. Many of the Services are now distributing on a horizontal basis, which means the reserves are getting some of these items of equipment at the same time that the actives are getting them. Reserve pilots are flying the same modern airplanes that their active counterparts are flying, and reservists are operating the same tanks and are on the same ships as the active forces.

Along with the improvement of people and equipment have come considerable increases in the resources for training. Last year, 80,000 personnel in more than 3500 units went overseas for training, in many cases to the area in which they will be expected to fight. This is a great step forward in demonstrating the increased ability of our present reserve component versus that of 10 years ago.

Differences Among Services. In addition to not understanding the reserves in general, people do not understand that each component is different. Although the Army, Navy, Air Force, and Marine components use their reserves in substantially different ways, people want to legislate generic solutions to reserve problems. *Decisions about force mix cannot be made in a generic manner.* One must look at the specific function and the specific component and evaluate it accordingly. The kinds of units that are expected to support the business of war in the Army are different from those in the Navy, which uses its reserves to join regular Navy ships and airplanes. The Marines, on the other hand, say that they will not require any reserves to accomplish their active-force mission of providing the first line of response; they see their reserves as reinforcements that follow the active force. A solution to a problem that might be good for the Army, therefore, might not be good for the Marines or the Air Force or the Navy. Also, since the branches use their reserves differently, they require different active/reserve mixes. Questioning the total force policy based on a perception that the Army reserve component is imbalanced without looking at the Marines, Air Force, and Navy to see if the same problems exist is inappropriate.

The Role of the Reserves. A series of factors—the increased capability of the reserves, the total force policy, and decreasing budgets—suggests that we must make better use of the reserve force: As the capability of the reserve force gets better, people look for a way to use it. That propensity is going to get stronger as the budgets decrease. As the pressure for increased use of this capability comes, we must examine the issue of the changing nature of reserve duty. The total force policy says reserves should be an integrated, primary reinforcing part of the force. If we're going to put the asset there and expend the resources to make it capable, then we ought to determine how to best employ it. The Navy has been very vocal the past year about Title 10, paragraph 673b—authority for the president to call and use these personnel.

Interchangeability. Congress in hearings points out that a reserve infantry battalion is not as good as an active battalion. Should it be expected to be? Despite misperceptions to the contrary, the total force policy does not say that units should be interchangeable. Some reserve units are as good as active units, and we have some reserve units that are the *only* units that perform some functions. But the belief that the reserves should, across the board, be interchangeable with the active forces is misguided. We need to use reserves to perform functions that we don't need on a day-to-day basis in

the active force but that we will need in the case of a contingency. We ought to be judged on how we put the total force together, not on whether reserve units and active units are interchangeable. That is what the total force directive addresses.

Active/Reserve Mix. What decision criteria do we use to get to the best mix of active and reserve forces? That active/reserve question will be a central focus of what we look at for the next four to five years as the conventional talks go along. Do we reduce active forces and, if so, what do we do with them? Should we bring those forces back to CONUS, should we put them into reserve forces, or should we take those actives out of the force totally? In order to answer such questions, we will need cost-effectiveness measurements, which currently lack uniformity.

Costing Methodology. No OSD staff agency or Service agrees on costing methodology. Decisionmakers must decide between the credibility of two totally different methodologies, because the Service will have one set of arguments based on one costing methodology and OSD will have another. Making an intelligent decision when you're comparing apples and oranges is difficult if not impossible. It is impossible, for instance, to determine whether it is cost effective to transfer something to the reserves when we don't have an agreed-upon basis of methodology for preparing the savings from that transfer. So there are great dividends to be reaped from research that can help us reach a consensus on which costing methodology should be used. On the other side of the cost-effectiveness issue, we don't have a good method for comparing capability. The SORTS is not adequate, and the models used by JCS and the Services are not valid in this case. The go-to-war models from which force structure requirements are developed most of the time treat reserves and active forces the same, particularly in the combat service support area.

Stability, Attrition, and Change. The only way the reserve component will ever approach the active component in terms of capability is to have stability. The real advantage of the reserves is the person who has been in the same job for many years, which is something you do not have in the active force. In this way, the reservist makes up for the fact that he is active only for 39 or so days. However, in order to have this stability, we must obviously retain these personnel. Attrition is a challenge we have to look at in great detail because the number of eight-year enlistees who do not complete their obligation is astounding. As the budget decreases and there is more pressure to shift forces to the reserves, the stability and attrition problems will become even more

important. Research on the subject has outlined some steps we can take to improve this situation, but much more needs to be studied about such concerns as the turbulence caused in units by attrition and force changes. There is considerable debate about how we measure attrition. For example, if a person goes from a Guard unit to a Reserve unit or to an active unit, he is not really lost in the system—but chances are you will still have to train that person all over and spend money to do it. A related issue is: How can we better use prior-service skills within the reserve unit?

Stability is a critical part of enhancing or building reserves, yet we live in a world of change. Technology is moving very fast, and this affects stability and experience. Because of modernization, new systems are constantly being introduced, and reserve personnel must learn how to operate and repair them. But technology is only one factor. The Capstone process—the process of associating reserve units with active units for training and war planning—seems to be in a constant state of change. The idea is to let them meet with and maneuver with the active force and to show them where they will fight. But for this to work, there must be continuity. If a reserve commander spends 80 days a year for three years to make this process work and then someone decides to Capstone him with someone else the fourth year, all that hard work and readying for a particular part of the battle have been voided.

Training. According to the resource data (such as SORTS), the equipment on hand is no longer the primary issue for the reserves. Training—the proficiency of individuals and the availability of their time—is becoming the key challenge that the reserves must overcome, and that issue should be part of the consideration of what research is done. We still have the challenge of how, on a part-time basis, to create capable units in a complex world with complex weapons. A central issue, then, is: How can we overcome the training environment that we find ourselves in and prove the units will be able to meet the requirements? Many innovative training ideas are being implemented that evolved from one kind of study or another. Simulators are one example. Now we are studying how accurately they function, whether they replicate the necessary skills, and so forth.

An important training question that needs to be studied is: Can we, in this environment, go to a different kind of schedule? The Navy has been examining a different training scheme; instead of one weekend a month, its reservists go for a longer period of time—five to seven days—once a quarter. In some cases we find that

employers prefer this to more frequent disruption. Would that enable us to solve our skill retention problems? Time is our most important resource because it is finite and a major factor in capability.

Individual Ready Reserve. We have not paid enough attention to the IRR. There are many talented people out there who are not now participating but who might if the system were different. This gets back to the nature of reserve duty. In the various surveys done by Reserve Affairs, we have already begun to see the impact that reserve service has on employment (as well as family life). Considerable innovative effort is going on in various quarters to try to marry up the value of reserve service to the employer, with the aim of convincing employers that letting an employee go to school is a good idea because he brings back skills to the corporation that he might not otherwise gain. However, we have only scratched the surface in this area. And as the conflicts with employers become greater as greater demands are placed on our reserve units, then the importance of this particular aspect is going to increase.

CRITERIA FOR PRIORITIZING RESEARCH

As suggested above, there are a number of issues that need addressing through analytic research. The question, then, is: How do we prioritize the limited research funds and maximize the capabilities of the FFRDCs? Below are offered several criteria for prioritizing research efforts.

Continuing Usefulness. A study that takes a long time to complete but sits on the shelf without being used is not a good use of research funds. Reserve Affairs places a high priority on a study's *continuing* value. One example is developing decision tools that enhance our ability to determine issues. That kind of tool does not address a one-time problem; it has a long-use life. Automated systems that provide policymakers with information with which to make decisions are highly valuable. We have the RUPS system, an automated system that greatly enhances our ability to manage information and gain insight into the resourcing of the reserve forces. We also have modules of the RUPS system, which are in various stages of development, that go beyond readiness to handle personnel issues, training issues, and equipment issues. We have another system that will give commanders at all levels a menu of DoD and non-DoD training that is available. There is a plethora of great training ideas, but they are listed in different resource catalogs. This system, which will be of continuing value, will provide an

automated capability for a commander to look at what correspondence courses and training devices are available, and it is especially focused around weapon systems and occupations. Another example of research that can have a long-use life is costing methodology.

Timeliness. One of the recurring difficulties is that it takes a very long time to get an answer from the research process. Part of this is due to contracting offices not defining precisely what we want done, and part is due to the nature of the work. Nevertheless, unless the research provides a timely answer, the study often does not have an impact. This is not to say that there is not a need for long-term research on complex problems, but timeliness is a major criterion.

Applicability Across the Services. A priority when allocating limited funds is to ensure that a study applies across the Services instead of to only one of them. Also, each Service has research going on, and we need to look more closely to see if various efforts can be integrated.

Credibility. We have difficulty with the validity of some of our studies, and part of the problem is in our inability to define parameters before we start. We criticize the General Accounting Office because it sometimes uses invalid sampling or applies conclusions to all Services that are valid for only one Service, and yet we conduct research and support research that does the same thing.

Policy Impact. Recently the DoD Inspector General's office applied an interesting criterion to research: Is there a direct link to a policy change resulting from this particular action or study? If we applied the same criterion—i.e., Do the products of a study directly affect policy?—we would be in trouble.

In conclusion, what a conference such as this can contribute is helping to decide how to best use our limited research dollars and to reach a consensus on which areas, of the many that need to be studied, have not had sufficient attention.

DISCUSSION

A major topic of discussion was active/reserve force shifts. Most participants agreed that there are going to be pressures to shift resources or missions from the active components to the reserves because it is perceived that it can be done cheaper that way. The concern was voiced that people may not pay great attention to the consequences for military capability. The pressure will be there to shift, and someone in OSD will have to estimate how much money that will save. This is why it is so important for there to be valid costing methodologies to ensure that the Services can present an effective case.

What should not be done, most participants agreed, is to make a judgment across the board that a 20 percent shift, or 40 percent, or whatever, be made. It was felt that in some areas the shift into the reserves has already been pushed too far and needs to draw back. The danger is putting something into a force and not considering the capability degradation until DoD needs to respond quickly to meet a wartime need.

An important point was that if the JCS models do not show a capability degradation by shifting missions from the active to the reserve components, then there is no argument to offset the "savings."

Part of the discussion focused on the issue of uniformity in costing: the approach to achieving uniformity among the Services and the military departments, and the barriers to implementing uniformity. Although uniformity of costing was thought to be necessary, there was a recognition that the Services and military departments are hesitant to abandon systems they have developed and feel comfortable with.

The relative capability of the reserves was also addressed. A view endorsed by several participants was that the capability of the reserves tends to be underestimated, and that a better understanding or more accurate information would mean that there could be some shift in responsibility from the active to the reserve components. For example, qualities that are undervalued the way resources are currently measured include cohesion and the value of units being together for long times; instead, *individual* skills are measured against arbitrary rules much of the time. One recommendation was the command structure should be forced to make better use of these reserve units than it now does in certain circumstances.

One participant stated that there already exists proper political authority for the president to use those forces. However, using that authority is a major political

consideration because of the signal that is typically sent with what is viewed as mobilization. If more forces are to be placed into the reserves, the question that must be faced up to is this: Is the United States going to use these forces in something less than mobilization? That also affects employers' willingness to support the program; the reservists have never been exercised in that fashion before. It is known that a large number of the reservists are spending far more than 39 days a year fulfilling their military obligation, and their employers are accommodating that schedule.

The IRR was further discussed and its uses and potential elaborated on. The example given was medical personnel. Because there are not enough authorized spaces within the Selected Reserve units to meet the full wartime requirement, the IRR has the potential for maintaining skilled people who do not have the requirement to train with units but are nevertheless rapidly available for deployment. They are intended to fulfill the shortfalls in the active and the reserve units. Civilian skill areas that could be rapidly assimilated into the military have not been examined adequately. In the combat service support, many skills are common in the civilian community, such as lawyers, medical people, transportation people, etc., who, with proper incentives, might be brought into the IRR.

IV. TOTAL FORCE COMPOSITION—IMPROVING THE FORCE-MIX MANAGEMENT PROCESS

Don Srull, Logistics Management Institute

This presentation summarized the results of a 1983–1984 LMI Total Forces Study on manpower total force shifts. The main purpose of the talk was to provide a historical perspective on some of the issues being addressed in the colloquium. Many of the technical and organizational issues relating to total force policy have been remarkably persistent, and have not yet been fully resolved.

During the period 1982–1983, the Department of Defense was being asked repeatedly for information about the numbers and types of units being transferred or being considered for transfer into the reserve components. The recurring complaint by Congress was that they didn't fully understand how DoD was reaching decisions on total force manpower. Specifically, Congress said that different DoD officials gave different explanations and different figures. Behind this concern was an even more basic question: Why hadn't DoD transferred more units to the reserve components and thereby saved more money, since that had been Secretary Laird's intent when he declared the total force policy? As a result of these concerns, Congress mandated that DoD produce two studies describing the process by which it managed total force changes. It was further stipulated that an organization outside of the department perform one of the reviews, and LMI was asked to conduct that study.

OBJECTIVES AND SCOPE

LMI was asked to perform two tasks. The first was to review total force management procedures and describe the force mix decision process. The second task was to recommend improvements to the process that would make it more rational and understandable. The study focused basically on the force mix decision process during the PPBS (Planning, Programming, and Budgeting System) cycle; it excluded consideration of sizing the total force structure, developing doctrine or war plans, and agreements on the forward deployment of forces.

FINDINGS

The study concluded that DoD had no organized or formal decision process. Decisions were made, but they were made piecemeal within various stages of the PPBS cycle. Each military department had decision processes, but those processes were informal and uncoordinated. When decisions were made, there was little visibility into *how* they were made, and the decisions were difficult to track; as a result, it was difficult to provide an overall rationale to Congress of the total force mix at any given time. Finally, in some instances where changes in the force mix were analyzed, there were inconsistencies in decisions among military departments.

Total Force Policy Guidance. The study concluded that the main reason for this lack of uniformity in decisions was a lack of explicit DoD policy direction or guidance concerning total force composition. There was no coherent description of the status of the DoD's total force structure, what its goals were, and how it planned to get there. Such ground rules are needed so the military departments can move in a more or less consistent direction vis-a-vis total force policy. Also missing was any DoD-wide regular review of the total force status. More serious was the lack of a forum for such total force reviews. And finally, there was no central organization or staff looking at total force policies from the perspective of the secretary of defense. As a result, there was considerable potential for inconsistency and suboptimization in the total force management.

Force-mix decision criteria. Despite these deficiencies, there was similarity in how the Services considered force mix changes. Even though there was no systematic, consistent application of decision criteria, certain decision factors were common across the Services. For example, shifts to reserve units were constrained in all Services by the necessity of having forward-deployed forces plus a rotation base, by the desire to maintain a minimum capability without having to mobilize reserves, and by various legislative requirements. Similarly, there were common resource implications taken into account, including readiness level requirements, unit deployment time, and peacetime workload.

RECOMMENDATIONS TO IMPROVE THE FORCE-MIX MANAGEMENT PROCESS

To correct the various deficiencies, LMI made several recommendations:

- DoD, in conjunction with the National Security Council, should develop policy guidance on the types of contingencies to be handled without involuntary call-up of reservists. This was a serious vacuum in the policy area. Each military department independently estimated the minimum military capability the president should have at his disposal to respond to various contingencies without mobilization. The estimates were divergent. What clearly was needed was some policy guidance so that total force planning could move in a coordinated way. Previously, serious disconnects existed. The Marine Corps, for example, had active, immediately deployable force units, but essential Navy support for those units was being moved into the reserves.
- DoD should adopt and use a standard set of decision criteria that each military department could, if necessary, tailor to its needs.
- DoD should establish a high-level forum to discuss and review total force issues. LMI suggested that a major total force review should be held at least every four years.

TECHNICAL ISSUES

In addition to these policy issues, LMI identified three technical deficiencies—cost methodology, reserve training needs, and total force manpower impacts—that may be of particular interest to this colloquium.

Active/Reserve Cost Comparisons

Department officials who testify before Congress on manpower inevitably discuss cost, but the numbers are often different, and the elements included in the costs are often different. The reasons for the differences, in general, are lack of cost conventions, lack of standard cost elements, lack of a uniform approach, and no accepted methodology. The results were that inappropriate costs were often used, comparisons varied significantly, and force-mix decisions were indefensible on a cost-effectiveness basis. Some added discipline in the area of active/reserve cost comparisons was needed.

It is essential to realize that what is being traded off in an active-versus-reserve shift is resources and capability. There is a whole spectrum of unit alternative possibilities. A reserve unit can be built anywhere from no cost to near-100 percent of active unit cost, depending upon how it is manned and operated. The job for the cost analyst community is not to select "a number" or "a ratio" but to describe how performance characteristics drive the cost. In short, cost *relationships* are needed. LMI recommended that PA&E and the OSD comptroller jointly develop cost standards so that there would be a consistent framework within which people could discuss total force costs.

Reserve Training

Behind the concerns of many senior military people about how far military capability could be moved to the reserve components was the issue of reserve training. The concern was that skill-level and readiness issues might not be simply a matter of money, but also a matter of time availability and, for certain skills, training feasibility. One question, for instance, was whether military-only skills can be taught to part-time military personnel and maintained at high levels of proficiency. Another concern about individual training was that if too many active positions are transferred to the reserves, the skilled prior-service people coming into the reserves will diminish below necessary levels. If certain functions are transferred totally to the reserves, then no prior-service people with those skills will be entering the reserve components.

LMI concluded that individual and unit training requirements will determine limitations on how far DoD can go in moving active units into the reserve components, but that additional research in this area is needed.

Manpower Issue

Currently there is not a unified, integrated total force manpower management system; rather, DoD still has separate active manpower/personnel systems and reserve manpower/personnel systems. This leads to unnecessary inefficiency and difficulty in utilizing total force manpower. Having an integrated manpower personnel system would clearly be much more effective.

In addition, many details of the personnel system of the active Services do not make good sense for the reserve components. For example, grade structure, promotion rate, and even the basic design of units in terms of personnel billet authorizations should

be tailored more to fit the needs of reserve units, rather than simply mirroring active unit design. LMI recommended that personnel/manpower policies be examined in terms of total force and that a total force manpower/personnel management system be implemented.

Another manpower issue cited by all the Services as a constraint on total force mix was the rotation base. Quantitative support for rotation base billet exemptions from total force mix, however, was spotty. LMI concluded that a more coherent, standardized way to describe and quantify how the rotation base should affect limits on force mix was needed.

Since manpower is the source of most of the savings that people hope to realize from total force, DoD should better integrate total force manpower management so that it can make the most efficient use of total force manpower.

DISCUSSION

One view expressed during the discussion period was that rotation base is really a cost question, but the Services treat it as though it is dogma. The Army, for example, says no more than 40 percent of any MOS can be forward deployed because they need a rotation base. But they could have more; the Army would just have to pay the personnel enough to keep them there voluntarily. The issue has never been analyzed that way. It's not obvious where the balance point should be, how it varies from occupation to occupation and from location to location. The question is deserving of study.

V. THE ANALYTIC TREATMENT OF RESERVE POLICY ISSUES

Stanley A. Horowitz, Institute for Defense Analyses

This study, begun in 1985, was requested by the ASD (Reserve Affairs), who had observed that reserve policy decisions seemed often to be driven by events instead of by an analysis of how best to support national strategic objectives. More specifically, the incumbent ASD recognized that there were persistent reserve readiness and capability problems that, in his view, were not being addressed.

OBJECTIVES

IDA was asked to look at the extent to which these problems were a function of the policymaking process. The objectives of the study were to (1) examine and describe the national strategic policy process as it related to total force issues and (2) investigate ways of more systematically and analytically tying reserve policy decisions to national defense strategy.

AN IDEALIZED ANALYTIC STRUCTURE

IDA developed an idealized analytic structure for reserve policymaking that explicitly links reserve policy and strategic objectives. The structure (see Fig. 2) incorporates five steps that must be taken if reserve policies are to efficiently support the goal of national strategy. The first two steps reach far beyond the reserves: define strategic objectives and obtain a force structure capable of achieving those objectives. Unless these two basic steps are taken seriously and are done properly, reserve policies that support strategic goals are unlikely to be achieved. The other three steps specifically address reserves: trade off expected cost against capabilities to obtain an efficient and effective active/reserve; ensure that reserves have the capability required of them; and achieve the required capability at a lower cost.

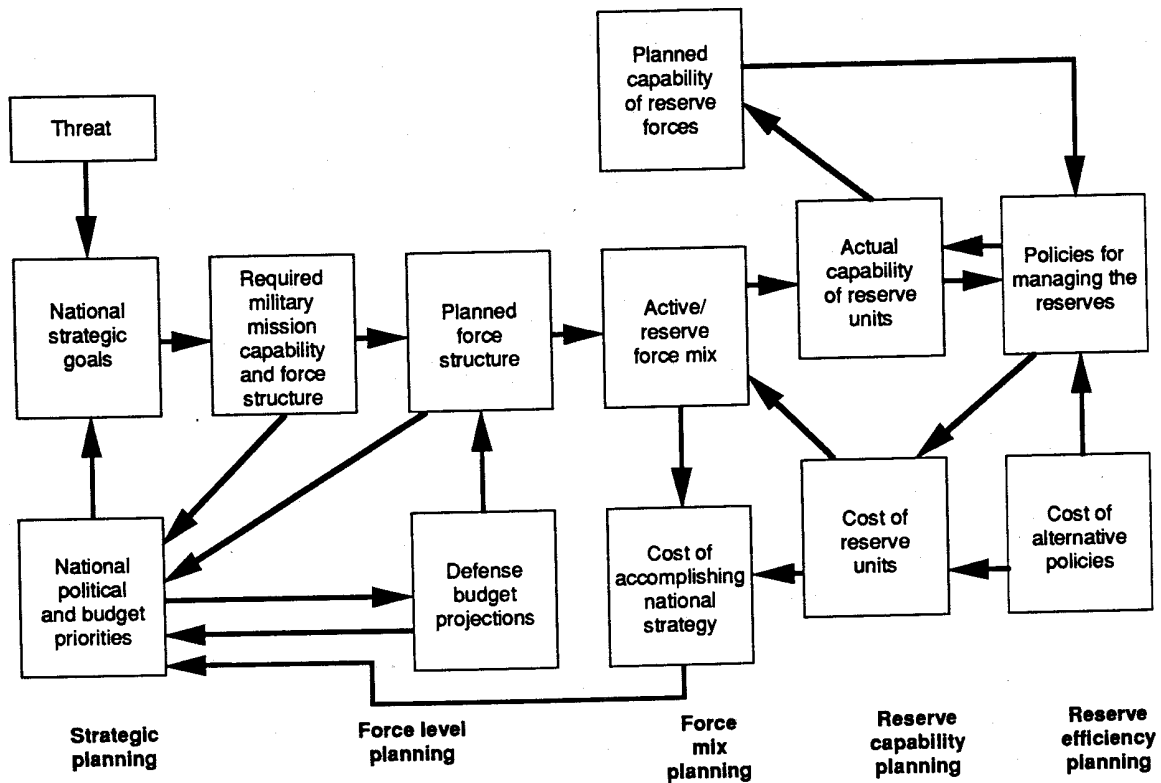


Fig. 2—A framework for tying reserve component issues to national strategy

OVERSIGHT OF RESERVE POLICYMAKING

The actual process of reserve policymaking differs in substantial ways from the idealized structure outlined in Fig. 2. The current process distributes responsibility for the guidance and oversight of reserve policy among a number of organizations, including the National Security Council, the Office of Management and Budget, Congress, the Joint Staff, CINCs, and OSD. For present purposes, however, only the military organizations are discussed.

Office of the Secretary of Defense

In the past, OSD has prepared the Defense Guidance, which specifies a single planning scenario oriented around a major war. This practice may have inhibited consideration of lesser threats that are quite relevant to active/reserve force mix planning. Although OSD reviews service POMs carefully, it seems that the OSD review at the first

level focuses narrowly around the Defense Guidance mid-term objectives (MTOs), and the MTOs become the basis for analysis in the review. Although the DG mentions the importance of total force planning, the MTOs actually give little attention to reserve issues. Finding discussions of reserve readiness and reserve issues in the MTOs is difficult; they occur in medical policy, but not much anywhere else. This situation suggests that the extent of OSD oversight of reserve issues should be increased.

In addition, there is fragmented responsibility for reserve issues within OSD. FM&P, Reserve Affairs, and PA&E are all involved, and the division of labor among them is unclear. Finally, there has been inadequate analytic attention paid to reserve issues. There is still no standard costing methodology, and capability and readiness often receive inadequate attention. The RUPS system, however, does directly address the adequacy of reserve capability, and perhaps that is slowly changing the situation.

The Joint Staff and the CINCs

The Joint Staff and CINCs have more prominence in the PPBS process because of the Goldwater-Nichols reform, but they still haven't been adequately involved in reserve issues. The Joint Staff is responsible for estimating requirements, making force structure recommendations, providing net assessment of U.S. and opposing forces, and reviewing service POMs. To do this, they make extensive use of analytic tools, especially wartime models that link forces to combat effectiveness. Nevertheless, they pay little attention to reserves, and they focus on MTOs in the POM review. Additionally, their models don't adequately distinguish between actives and reserves, and in particular they don't model many aspects of combat service support (CSS), which are a crucial part of the reserves' contribution.

One could argue that the CINCs are most affected by the reserve capability because it is they who use the reserves. Perhaps because of this, the CINCs regularly prepare integrated priority lists that highlight reserve problems, and they comment on all PPBS documents. However, they have little analytic support and pay surprisingly little attention to the reserves.

MAKING RESERVE POLICY

The responsibility for developing and executing most of reserve policy lies specifically with the Services, though their actions are considerably restrained by the

guidance they receive from above. The degree to which analysis is used to make reserve policy differs from service to service.

Army

The planning and programming process of the Army, which relies most heavily on reserves, looks very analytical. Force level and force mix planning are oriented toward accomplishing specific combat goals, and combat modeling is used extensively in development of requirements and force structure. Nevertheless, there are serious problems in the way the models handle reserves. For example, personnel and training readiness of reserves are not considered, and the models don't fully consider the impact of shortages in CSS.

Furthermore, the Army's active/reserve force mix seemingly follows from an active-oriented desire for forward-deployed combat troops, rather than being derived analytically. Another shortcoming is that reserve readiness has not always been adequately monitored to identify and correct problems. For example, there have been longstanding problems in medical readiness, providing training, and skill mismatches. A final shortcoming is that the appropriate size of the rotation base—a key factor in determining tasks that can be considered for the reserve component—is assumed, not derived analytically.

Navy

The Navy's strategic orientation is less specific than the Army's. The Navy maritime strategy, for instance, doesn't specify what forces are to be defeated at what time. Although the Navy relies much less than the Army on campaign models in planning and programming, its active/reserve decisions are nevertheless based on a consistent, explicit decision logic. The first requirement of this logic is the ability to meet peacetime commitments. Sometimes, however, this force mix planning requirement is ignored, for instance in the Marine lift ships. Other examples of disconnects are the placement of almost all mine-sweeping capability into the reserves a few years ago and the placement of all combat search and rescue capability into the reserve component. In general, force mix decisions have been made as required by budgetary and other pressures, and there hasn't been a real effort to optimize the mix.

More than any other organization in the system, though, the Navy has developed a mechanism for identifying readiness problems as a regular part of the programming

process. This has been quite effective in helping to develop and implement remedial policies when problems have been identified. Examples of such policies are the Navy's modular training programs and its recruitment of medical personnel.

Air Force

The Air Force uses a force mix decision logic similar to the Navy's, but reserve issues are not as visible in the POM process as they are in the Navy. The Air Force has been effective in maintaining high reserve readiness, and reserve readiness is monitored through inspections and evaluations. As with the other Services, shifts to reserves are usually made under financial or direct congressional pressure, and thus the decision logic is not always applied. A corollary of this is that some active/reserve choices might benefit from additional analysis, such as conventional bombing missions or fighter missions. In thinking about how far the Air Force can go in shifting missions into the reserve component, IDA believes that analysis is needed on the importance of active units as a source of reserve manpower.

CONCLUSIONS

The study found problems in policy development, execution, and oversight. Specifically, it found that although the Services have logical processes for active/reserve planning, they are not always properly exercised. Policy issues are addressed one at a time as necessitated by budget and other considerations, and there has never been a broad look at force mix. The study further concluded that there has been inadequate analytic oversight of service decisions concerning reserves, though the situation is improving.

In addition to these major conclusions, the study documented a variety of related problems. For example, it found that there is little feedback from capability to missions and strategy. Another conclusion was that reserve planning could benefit from consideration of additional scenarios. This could help with examination of where forces in the reserves may be needed, and also what reserve forces should be targeted for contingency use. The study further found that MTOs should address reserve policies more; otherwise, it will be too easy not to scrutinize reserve policies. Still another deficiency was that the combat models used as planning aids to form and assess force structure capture reserves inadequately. Similarly, data on reserve readiness have not always been gathered or acted on. There is SORTS, but better information might be

taken from other sources. Finally, the study concluded that important management issues have not been adequately addressed, including the adequacy of the recruiting base to support new reserve units, the proper size of the active force rotation base, training strategies for the reserves (including plans for predeployment training), and active/reserve mix within reserve units.

RECOMMENDATIONS

On the basis of these findings, IDA made a number of recommendations for improving reserve policymaking. The major recommendations were for DoD to:

- Develop representative contingency planning scenarios.
- Adopt MTOs addressing capability of reserves.
- Clarify and systematize the oversight role of OSD and the Joint Staff.
- Develop combat models that capture the contribution of all kinds of reserve forces—including CSS.
- Conduct zero-based force mix analysis.
- Develop a mechanism to identify and respond to reserve readiness problems.
- Coordinate long-term research on reserve management issues.

DISCUSSION

One comment following the presentation was that because policymaking for reserve affairs spans many organizations—OASD (PA&E), OASD (RA), OUSD (P), OASD (FM&P), the Services, and the Joint Staff—the effort must be made to build bridges so that information is consistently transferred in a rational manner. That the same issues and problems are seen from year to year suggests that they are not being adequately addressed, and part of this is organizational. The focus should be partly on how to make these organizations work together better.

Regarding review of total force matters, it was noted that the QRMCs (Quadrennial Reviews of Military Compensation) have focused on individual issues, one at a time. One time the focus is on reserves, another time on retention policy, but the focus is invariably on subissues. The total force problem is a broader problem, and the kind of staff and work being discussed here is more extensive. Doing a zero-based total force analysis, everyone agreed, is a huge problem.

An alternative view was that since the total force policy is a combination of many issues—human resources, capability, etc.—and is so broad, it can only be tackled on an individual-issue basis. Perhaps the way to do it, one participant suggested, is to analyze combinations of issues—like a QRMC, but focusing on more than one issue. Whittling total force policy into manageable parts for analysis might produce a better product than an effort to cope with it as a single large subject.

VI. DEVELOPING COST-EFFECTIVENESS GUIDELINES FOR TOTAL FORCE MANAGEMENT

Adele Palmer, RAND

The material presented here explores the implications of modeling DoD manpower decisions in a total force management context. The study shows how a modeling approach developed in a previous RAND study can be used to help develop general manpower management guidelines.

BACKGROUND

This research was motivated by the dearth of analysis that considers *all* of the total force problem. Instead of considering the entire mix of active forces, reserve forces, civilians, wartime needs, and peacetime needs, analysts typically study pieces of the problem. Personnel studies, for example, have ignored active/reserve/civilian substitution; substitution studies have ignored personnel inventory management; and costing methods have generally been ill-equipped to assess manning for both wartime and peacetime needs.

Discussion of this situation led several RAND researchers to conduct a two-month Concept Development Project, sponsored by OSD and the Air Force. In that work, RAND developed a rudimentary linear programming model designed to integrate all of these issues for what the researchers call a single "part of force" (POF). By that general term is meant that the analysis could apply to a function, a mission, a type of unit, or any part of a force.

Analysis using the model suggested a somewhat surprising observation: even though it is generally presumed that active personnel are more costly than reserves or civilians, *under certain conditions, active forces could be more cost-effective than a combination of reserves and civilians who might otherwise replace them.*¹

¹The findings of the original project are documented in *An Integrative Modeling Approach for Managing the Total Defense Labor Force*, RAND, R-3756-OSD/AF, December 1989.

GOALS OF THE CURRENT STUDY

This presentation gives the results of a follow-on project, sponsored by FM&P, in which RAND has built enhanced models that look at more personnel management options. One option was retraining programs that allow personnel to change occupational categories during their careers. Another option was reassignment of personnel at mobilization: they would be assigned to one POF in peacetime, another during wartime. And the third option is rotation programs that regularly relocate personnel among POFs in order to maintain manpower overseas.

The models have been exercised to study determinants of cost-effectiveness; that is, the models are being used analytically to ask basic questions about when and under what kinds of conditions it would be better to have a minimal active force supplemented by reserves and civilians, and when it would be better to have a larger active force that doesn't rely as heavily on reserves or civilians. In this particular project, the researchers are attempting to develop guidelines for cost-effective total force management.

DECISIONMAKING MODES: PLANNING AND PROGRAMMING/BUDGETING

In the Department of Defense there are two basic and very different decisionmaking modes. One is referred to as planning, and it looks at very broad-brush questions about missions, force structure, weapon systems, and so forth. Discussions and analysis in planning tend to be long-range, aggregative, and generalized. In contrast, another type of analysis is common in programming and budgeting, which takes those planning-level decisions and looks at them in far greater detail and for a shorter term. It looks in great detail at personnel inventory management, but usually in terms of actives only or reserves only or civilian labor force only.

These modes are important to this study for several reasons. First, the research team is trying to form a bridge between planning-level discussions and programming and budget discussions in terms of how personnel inventory is managed. Second, it is trying to develop general guidance on total force management, using the planning-level orientation of assuming that capability roles must be met and trying to find out how much they will cost. And third, discussion about quantitative analysis typically occurs only in the programming and budgeting arena, and what this project is doing is a planning-level quantitative analysis.

THE BASIC MODEL

For the basic model, goals for capability are established for three environments: a peacetime environment; a "surge" environment, which may represent immediate response to a short-term contingency or initial deployment for a full-scale war; and a sustainment environment. The main question being asked is: What kind of inventories (people) does DoD need in peacetime to meet goals in any of the three alternative environments? There needs to be some way to measure capability, and the standard labor unit used is what a full-time, fully qualified person could do. Capability among personnel who may be available part-time or may not be fully experienced are measured relative to that standard.

Alternative choices of personnel are represented by what the researchers call "life cycles." Each life cycle generates capabilities, which depend on availability and effectiveness, and costs, which include recruitment, training, pay, retirement, and so on. The researchers take into account the full career that someone might have in the Defense Department, recognizing that just one year of an enlisted man cannot be bought.

The research team is seeking to select the least costly life-cycle mix that meets all the goals, and it uses the linear programming method to do that.

FOUR LIFE CYCLES

The models being used have four life cycles (see Fig. 3). In the first type of life cycle, a person enters the active service, is in the junior inventory for a period of time, and has some probability of being retained to enter senior inventory. In the second life cycle, a person who enters the active force may remain in military service either by continuing in the active forces as senior personnel or leaving the active forces and entering the reserves as a "prior-service" accession; the study therefore deals very directly with the connection between the supplies of labor to active and reserve forces.² The third life cycle is nonprior-service (NPS) reservist. And the fourth life cycle models the civilian accession and retention pattern.

In these models, the first two life cycles permit the model to determine to what extent prior-service reservists should be used. If the model selects only the first life cycle, it is indicating that using prior-service reservists isn't the best option. If it selects only the second life cycle, it is recommending the use of all the prior-service personnel

²Each life cycle includes whatever training personnel are needed for the personnel in that life cycle.

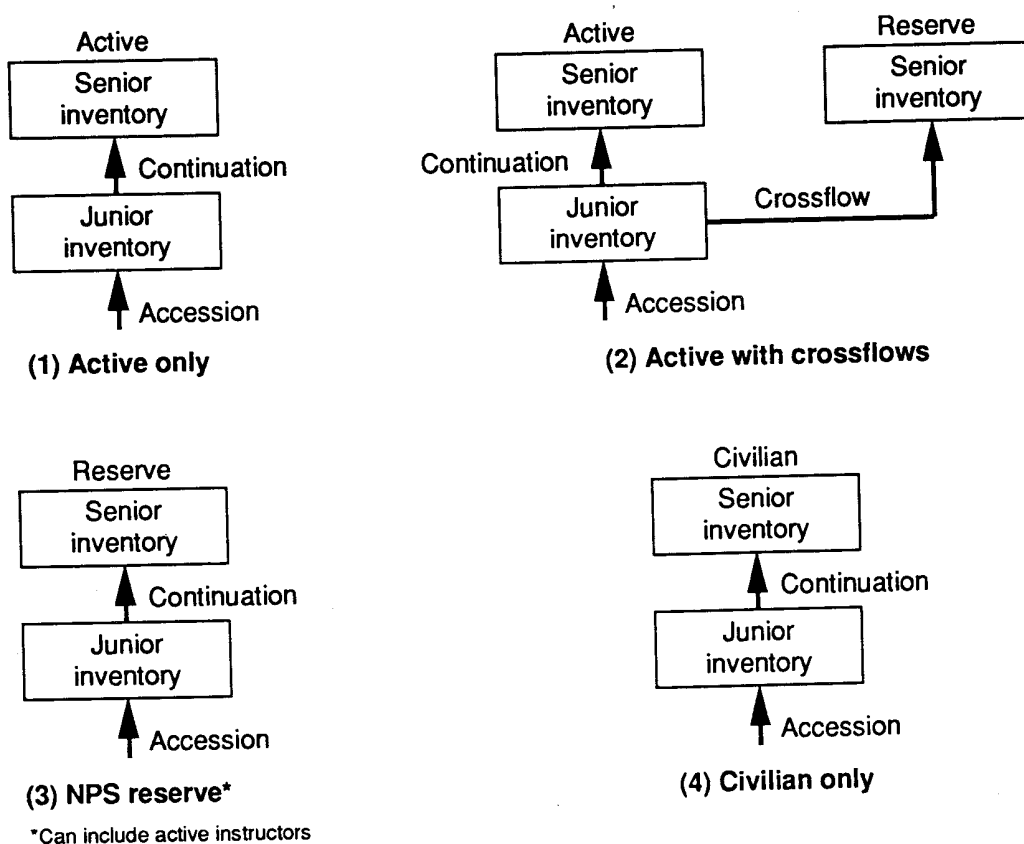


Fig. 3—Four life cycles

available. If it selects a combination of those life cycles, it is suggesting the use of some—but not all—of the prior-service accessions available to the reserves.

A similar approach can be used to let the model choose the optimal level of retention for actives, NPS reserves, and civilians. However, that would require adding more life cycles to the model, and the researchers have not attempted that so far.

LIFE CYCLE CALCULATIONS

The model deals with steady-state inventories. That is, it asks: If the number of accessions into each life cycle is maintained every year indefinitely, what kind of inventory will be generated, what would be the capability of that inventory, and what would be its cost? Calculation worksheets are constructed for each life cycle. The inventory from 100 accessions is calculated (net inventory for the POF is gross inventory

less training requirements); then the amount of labor capabilities generated by those people in each of the three environments is calculated (capability depends on net inventory availability and effectiveness); and finally the cost is figured. (Each life cycle carries the cost of required instructors and trainees.)

OBJECTIVE FUNCTIONS—TWO MANAGEMENT PRINCIPLES

The idea is to select the best combination of life cycles that meets all the capability goals. To do this, the researchers specify alternative objective functions.

Existing guidance on total force is modeled as minimizing the cost of military forces; it is based on DoD Instruction 1100.4, which says civilians should be used where possible, and on informal guidance that indicates reserves should be used whenever they can accomplish the mission and are less costly than actives. This guidance leads to the smallest active force and is labeled in this research as the "Minimum Active Force" (MAF) principle. Alternatively, the objective is to minimize the total costs of meeting all goals; this is referred to as the "Cost-effective Active Force" (CAF) principle.

NET COST-EFFECTIVENESS ANALYSIS

To see how the MAF and CAF guidelines compare, let us consider a simple illustrative case. In this case, all goals are measured in terms of what one active duty person could do in each environment; civilians are assumed to be unavailable during wartime; and reserves are mobilized only for sustainment. This means the minimum active forces are the number of active forces needed for surge, since civilians and reserves can do the job in other environments.

The question to be answered is: What would be used besides active forces, and if active forces were added to that minimum force, could they be cost-effective? In order to answer that question, three goal structures must be considered. The first one, which will be called Case A, supposes that armed forces have heavy sustainment requirements (larger than in surge) and relatively minor peacetime needs. This is basically a combat support unit. Case B is the opposite situation: heavy peacetime needs, relatively small sustainment needs—or most of the sustainment needs could be met by hiring new people out of the civilian sector. Case C has heavy peacetime and sustainment responsibilities compared to surge.

The three goal structures can be represented as follows:

- Case A is sustainment > surge > peacetime; "extra" active personnel replace reserves only.
- Case B is peacetime > surge > sustainment; "extra" active personnel replace civilians only.
- Case C is sustainment and peacetime > surge; "extra" active personnel replace both civilians and reserves.

Only in the third case would extra active personnel—that is, in addition to the minimum force—be able to replace both civilians and reservists. In the other cases they would replace only one kind of personnel.

In the analysis, the net cost effect (NCE) of having an extra active person is computed as the cost of the active person minus the cost of the people he or she can replace; if that number is negative, then some savings could be achieved using extra active forces, i.e., having a force larger than the minimum active force would be cost-effective. It is typically found that active personnel are more costly than either reserves or civilians, and our data suggest that as well. However, when active personnel can replace a combination of reserves and civilians—as in Case C—we find that to be cost saving under reasonable conditions.

THE CASE FOR EXTRA ACTIVE FORCES

The argument for having extra active forces in a Case C POF can be illustrated graphically (see Fig. 4). On the vertical axis is the active/civilian pay ratio, which is difficult to measure—not because the cost of people isn't known, but because who gets replaced by whom isn't exactly known. On the horizontal axis another uncertainty is being measured: how effective reserves are, compared with actives. The curve on the graph represents the combination of those two uncertain variables for which an active person is just as cost-effective as the reserves and civilians he or she can replace. (That is, the NCE is zero everywhere on the curve.) Above that curve, the minimum active force should be used. Below the curve, extra active forces are cost-effective.

Let us consider an example. Suppose DoD is looking at a part of the force that has heavy peacetime needs and heavy sustainment needs; just enough active forces will

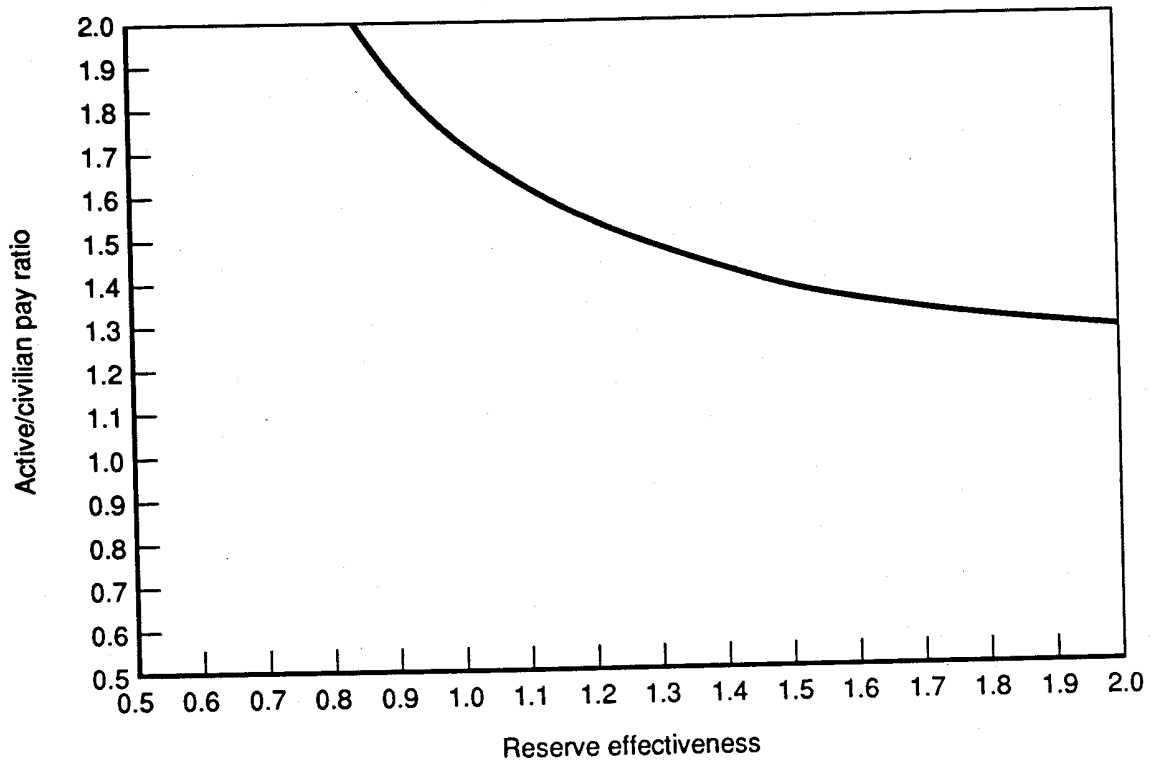


Fig. 4—The case for extra active forces in a Case C POF

be available for immediate deployment needs; civilians will be working there in peacetime; and reliable reservists will be used for sustainment. And DoD wants to know if it could save money by using more active forces and fewer of those other personnel. What this graph shows is civilians could be as much as 20 percent less costly than those active forces, and reserves could be twice as effective as the actives, and *it would still be cost-effective to use extra actives to replace them*. The reason is that more of the active forces can be used in peacetime for a job that would be done by civilians. That same active person is in the inventory, and he is being paid just once. He is around for the initial deployment, and he is around for the sustainment. In essence, it's better to have one person on hand who can be used if a war occurs than to have many people who can't be used as well. Notice that whether relative reserve effectiveness is 1.0 or 1.2 or 0.9 doesn't significantly matter because, using FY86 data, there is a huge range of reserve effectiveness values and a huge range of active/civilian pay values at which extra active

personnel are cost-effective. Exact measures of relative effectiveness and relative pay are not necessary for determining whether extra active personnel are cost-effective. What matters most is the goal structure of the activity under consideration.

DUAL-USAGE SCENARIOS

What about Cases A and B? Usually in these cases the comparison is of active forces replacing civilians, or active forces replacing reserves, and the active personnel always look too expensive. Such two-way comparisons generally conclude that civilians are more cost-effective than active forces in Case A, and reserves are more cost-effective in Case B.

The problem with this two-way comparison is that it looks at one function or one type of unit at a time, when in fact in managing the force there are ways to use active personnel in multiple functions or units. The RAND researchers call those dual-usage scenarios, and they pose three of these dual-usage scenarios: mobilization management, retraining management, and rotation management.

The mobilization management scenario is where the active person could be used in a Case A POF in peacetime, but in a Case B POF in wartime. When this scenario is analyzed, we find that extra active forces, over the minimum forces, can be cost-effective if the dual training needed to perform these different functions is not too expensive.

The second type of scenario involves retraining: A person spends part of his career in a Case A POF, and then he is reassigned and retrained and spends the other part in a Case B POF doing something else. In this situation, extra active troops can be cost-effective if a person's substitutability changes during his or her career, though this depends again on the additional training costs.

The third case, rotation management, has a person partly available to the Case A POF, partly to the Case B POF. The person performs one kind of duty some of the time and then performs another kind; he might be in Europe for a while and then go back to CONUS for a while.

Rotation raises the MAF required to man the (Case A) combat activity. Thus, rotation policy does the same thing that the cost-effectiveness rule would do: expand the active force. However, rotation management under the CAF and MAF rules can still differ—because the CAF rule would seek the least costly ways to use the active force in its CONUS assignments. That is, the CAF approach can be used to select cost-effective combinations of POFs to use in rotation programs.

THE CASE FOR REVISED GUIDELINES

The CAF principle never costs more than the MAF principle. It will never add extra active troops unless doing so will save money. Both principles are specified to meet all goals, and both can incorporate exceptions, such as rotation policy rules.

Whether CAF would really save much money is an empirical question that has not been studied in this research. It depends on what the goal structures look like for individual POFs, on relative civilian pay and relative reserve effectiveness, and on implementation of dual-usage policies.

Guidelines Development

The primary focus of the current research is the development of a guideline methodology. Obviously, DoD analysts don't want to have to run a linear programming model every time they must make a decision. They need instead to be able to do some basic calculations that will tell them what kind of a situation exists and suggest a cost-effective manning strategy for that situation. RAND has been developing a technique for aiding such evaluations, and the technique is based on "cost-effectiveness criteria" (CEC).

Cost-Effectiveness Criteria

There are two types of criteria: goal pattern criteria, and cost criteria. When looking at a project or a mission, the questions that should first be asked are: What is its goal structure? Does it have to do more in wartime or peacetime? Does it have to do more in the initial period of a war or later on in a war? And to what extent can personnel accessed in wartime meet wartime needs? These are absolutely crucial questions to begin looking at the cost-effective solution, and yet some of them are seldom raised. What the researchers suggest is that relative capabilities of active, reserve, and civilian personnel be used as a basis for "goal regions"; then, a POF's peacetime and sustainment goals should be compared to surge in order to determine which region the POF is in.

After that, there is a whole series of cost criteria that have to do with how different personnel compare with each other in terms of cost. The partial NCEs are computed for all feasible replacement patterns, and the results are shown as yes/no answers to a set of cost questions. "Cost categories"—category one, category two, category three, etc.—are then defined based on the pattern of these answers.

If an analyst determines that he is in cost category two, for example (see Fig. 5), the guidelines will help determine very quickly which type or combination of forces will

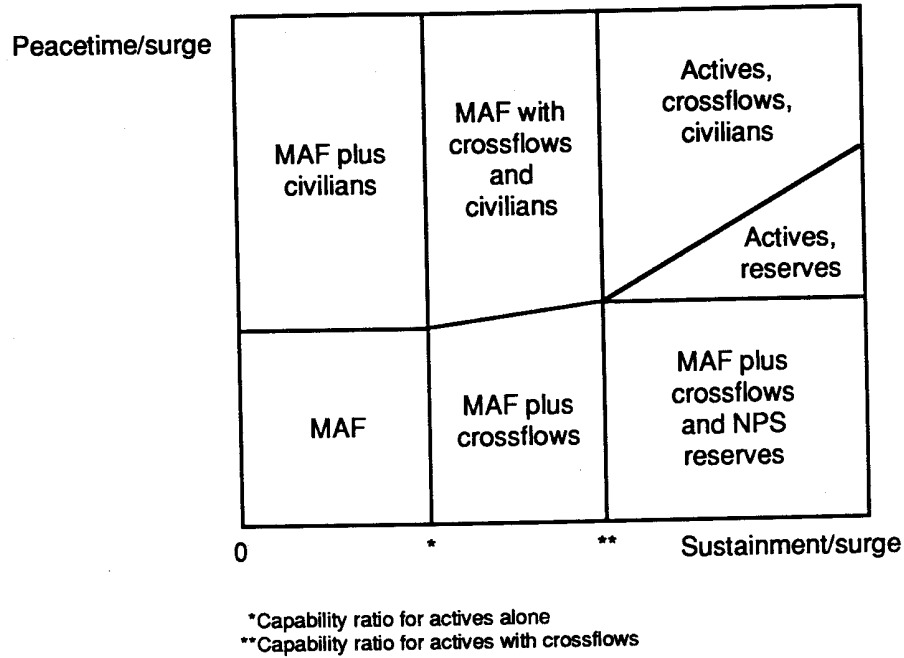


Fig. 5—Guidelines by goal region for cost category two

be most cost-effective: should the minimum active force be used, should civilians be used, should prior-service reserves or nonprior-service reserves be used, and so forth. In addition, if extra active forces are to be used, the guidelines will help to decide how many to use before they stop being cost-effective.

CONCLUSIONS

The basic conclusion of this research is that different results occur between the cost-minimizing approach and the current preferred guidance. More specifically:

- The CAF and MAF principles can lead to different results in Case C POFs, and the CAF principle can save money.
- Combining POFs through dual-usage programs can make Case A and Case B POFs "look like" Case C.
- Management guidelines can be developed to implement the CAF principle.

- The guidelines are complex and multidimensional, but so is the existing guidance. CAF guidelines provide a basis for quantification, and they assure that all considerations are recognized simultaneously.

What has been presented here is a way of clarifying some of the principles and comparisons that are being made and providing an analytic base to make these judgments.

VII. ENHANCING THE MEASUREMENT OF READINESS AND SUSTAINABILITY

S. Craig Moore, RAND

Accurate measurements of military readiness and sustainability (how quickly and for how long forces could be employed) are important because decisionmakers rely on that information to assess national security, plan operations, and budget military resources. Current measurements of readiness and sustainability (R&S) are inadequate, however, and Congress has repeatedly complained to the military departments that estimates of readiness and sustainability are not credible. To help improve the assessment of R&S, a team of researchers in RAND's National Defense Research Institute conducted a study on this issue sponsored by the Office of the Secretary of Defense and the Joint Staff. The scope of the study was comprehensive, covering all military Services, all types of units, and all resources. The objective was to conceive of and develop an improved conceptual framework for measuring R&S.

CURRENT MEASUREMENTS ARE INADEQUATE

At present there are two systems primarily relied on for measuring readiness and sustainability: Status of Resources and Training System (SORTS) and Days of Supply (DOS). SORTS tells how many personnel are available, the status of their training, how much equipment is available, and the condition of that equipment—all in relation to stated requirements. DOS is a compilation of stocks on hand, compared to established requirements. The problems with SORTS and DOS are multiple: the "requirements" change; commanders can adjust the assessment based on their subjective judgment; underlying assumptions are masked; mobilization improvements are ignored; functional inconsistencies are not clear; and, most important, they indicate only the resources on hand, not what the military could *do* with them. In short, they do not provide decisionmakers with readily understandable measures of readiness and sustainability that relate clearly to funding levels.

DEVELOPING AN INTEGRATED SYSTEM

The research team conceptualized an *integrated* R&S measurement system that would synthesize existing assessment tools and link today's disjointed reporting of assets and stockpiles with evaluations of mobilization and deployment potential. Such an improved design would allow DoD to estimate the levels of activity that could be achieved over time in different mission areas. In developing this recommendation, the research team first established criteria for an ideal R&S measurement system. It should: measure outputs (mission, location, scale, time), not merely inputs; stay practical (undisruptive, inexpensive, understandable); be objective and verifiable; reflect robustness (across scenarios and across uncertain assumptions within scenarios); be useful to data providers; permit comparisons from one year to another; be comprehensive (i.e., include peacetime manning, stocks, and operation tempos; mobilization; and deployment); and permit evaluation tradeoffs. These criteria were selected after extensive discussions with offices in all of the Services, OSD, DLA, the Joint Staff, and with congressional staff.

There are seven "families" of existing methods that address readiness and sustainability to some degree. It should be possible to integrate many of them into one system to achieve the desired characteristics listed above. Three of the methods are oriented toward *units*:

- *Unit asset reporting*: inventorying resources in individual units.
- *Unit modeling*: simulating the mission activity levels achievable with specified resources.
- *Functional tests*: measuring units' abilities to perform their wartime tasks.

The other four methods are oriented toward *forces*:

- *Stockpile reporting*: inventorying resources outside of individual units.
- *Mobilization planning*: scheduling for organizing forces and for accelerating production.
- *Deployment planning*: assessing the feasibility of moving forces/supplies from peacetime to wartime locations and scheduling their movement.

- *Combat modeling and war gaming:* projecting the results of force-on-force conflict.

Each method is complex in its own right, has its own organizational constituency, involves substantial data and computer resources, and has strengths and weaknesses. Most important, however, each could be enhanced for purposes of R&S measurement. That most elements of the integrated framework already exist in one form or another suggests that actually making integrated assessments is an attainable possibility. (The research team does not recommend including combat modeling or war gaming in the framework; these go too far beyond R&S, requiring information about the enemy, strategy and tactics, weapons effectiveness, and so forth. Also, they are not likely to be able to treat R&S effectively enough in the near future.)

As shown in Fig. 6, an integrated R&S assessment framework would be employed in the following sequence: (1) Asset and stockpile reporting would collectively reflect manpower and materiel available, their location, and their condition. (2) Mobilization analysis would project the numbers of additional units and materiel that could become available over time. (3) Deployment and distribution analysis would translate information about increased resource availability into additional units and materiel that could be placed in combat theaters. (4) Operational analysis would use assumptions

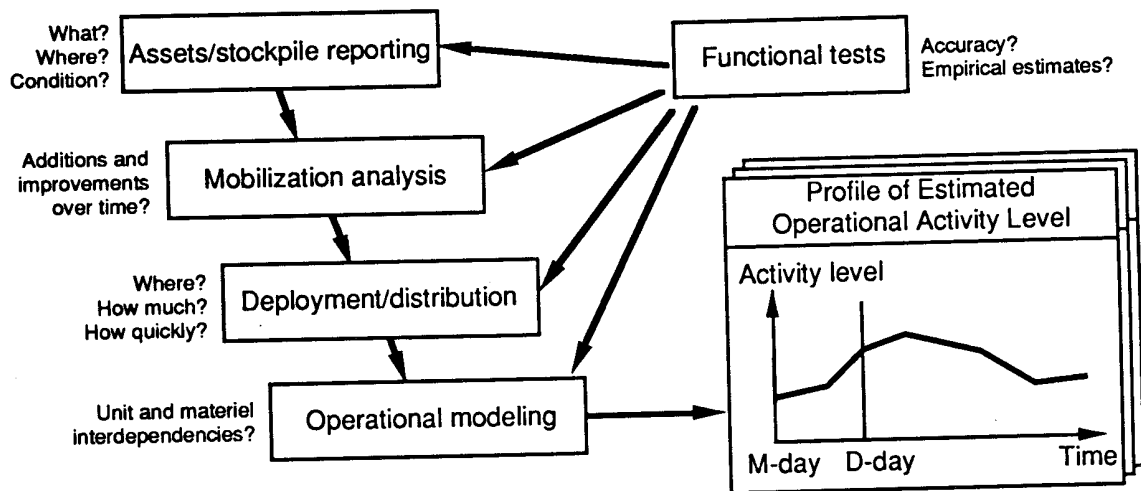


Fig. 6—Strategic concept: an integrated R&S assessment framework

about quantitative mission/engagement objectives—and corresponding expenditures, attrition, etc.—to translate unit/force and materiel quantities into activity levels achievable over time for different mission areas. (5) Functional tests would be employed to verify (or possibly to estimate) the input-output and time-capability relationships used in different steps of the process. Figure 7 is an illustrative profile of an estimated operational activity level. It is fairly easy to see how the shape of such a profile would change with changes in factors like those listed to the right in Fig. 7.

IMPROVING ASSESSMENT METHODS

Until an integrated system is developed, there are incremental improvements that can be made to the existing R&S-related assessments that will enhance their usefulness, as follows:

- *Unit asset reporting:* emphasize the time and resources required to achieve performance standards; make sure that units maintain the resources needed to train up to those standards and that additional resources would be available, if any were needed for wartime.

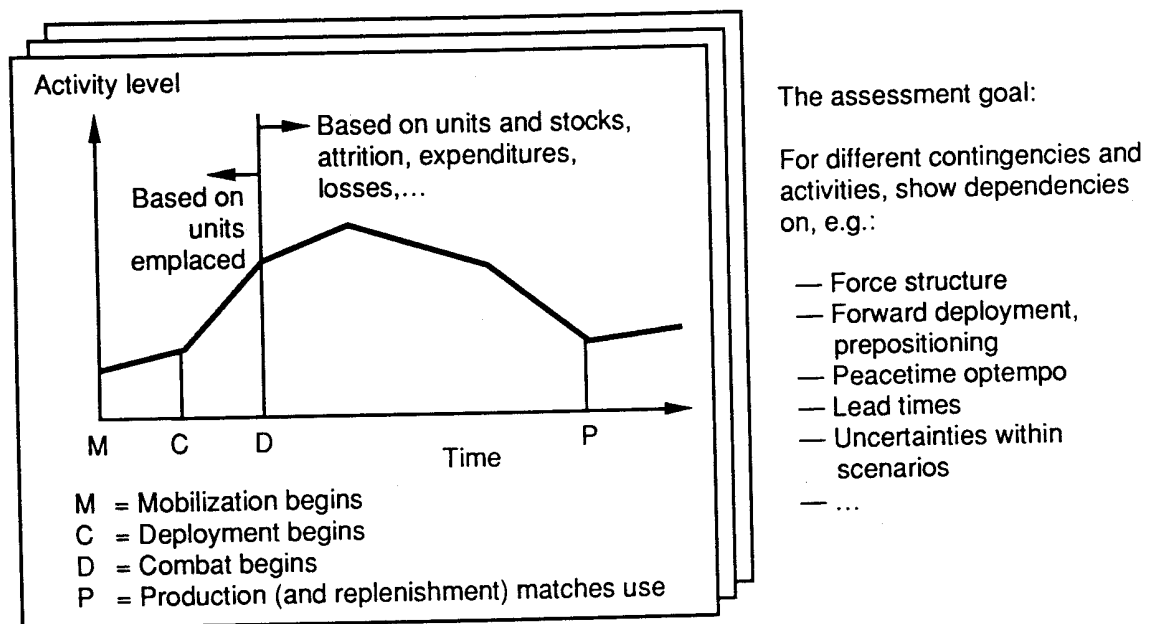


Fig. 7—Profiles of estimated operational activity levels

- *Unit modeling:* Streamline data and computational requirements; address interdependencies among units and materiel.
- *Functional testing:* Use shorter advance notice, greater uncertainty of test content, and external evaluation of test results.
- *Stockpile reporting:* Emphasize quantities of different mission activity levels achievable; make explicit the assumptions about stockpile usage; consider resources not currently reported.
- *Mobilization planning:* Identify the time required to assemble and train units; examine the internal consistency of the resulting forces; on the industrial side, specify more accurately wartime's time-phased materiel needs and production capacities.
- *Deployment/distribution planning:* Streamline data and broaden the scope of the analysis to include operational theaters.
- *Combat modeling and war gaming:* Represent logistics and manpower constraints more fully.

These improved methods would contribute to a fuller understanding of unit readiness, force readiness, and sustainability. It was recommended that these enhancements, which can be undertaken independently, begin in the near term.

This study, which is basically conceptualization, is Phase 1 of a larger project. In the second phase, the research team will determine the feasibility of the overall assessment framework, working toward a preferred implementation approach and, simultaneously, working with the Services to establish practical ways of estimating and testing unit train-up times.

VIII. OPERATIONAL TRAINING AND PERFORMANCE OF COMBAT UNITS

Glenn A. Gotz, RAND

The purpose of this presentation was to communicate the results of a literature survey RAND conducted on the relationship between the operational training a unit receives and that unit's ability to perform its wartime tasks. RAND was asked by OASD (FM&P) to review the status of the quantitative literature on relating the peacetime operational tempo (optempo) to the proficiency of units, and to recommend new directions for research in this area. The study identified key concepts required to link training resources to the proficiency of military units, summarized the state of knowledge that is based on empirical research, and recommended steps DoD could take to fill the gaps in the current knowledge.

POLICY ISSUES

Several important policy issues are associated with operational training. The key policy/budget question is whether peacetime operations budgets can be reduced without causing significant degradation of unit proficiency. Measuring the effects of changes in peacetime optempo on the proficiency of combat units therefore becomes a key research issue. (The measures of optempo are typically flying hours, steaming days, and combat vehicle miles.) Another policy question concerns tradeoffs. That is, what tradeoffs can be made among training activities and other factors to maintain readiness, and what are the resource/cost implications of those tradeoffs? Can one substitute other things for optempo dollars that would be less costly but that would continue to maintain proficiency? These issues, which were the initial motivation for the study, continue to be debated within the defense policy community.

SCOPE OF THE RESEARCH LITERATURE

The principal concepts treated in the literature are operational training activity and proficiency of crews and individuals. A typical example in the literature might address the question: What happens if flying hours are changed, and how much does that affect the ability or scores of small crews or individuals? Obviously, this is only one small

piece of an overall question about capability. The performance of units is built up from proficiency of subunits and their interaction; readiness is dependent on unit training status, personnel inventory, equipment inventory, etc.; and capability is dependent on readiness, sustainability, equipment modernization, force structure, etc. Apart from individual and small-unit proficiency, therefore, there are additional issues of the performance of larger units, which are built up from smaller units.

The literature, however, generally does not address these broader questions of capability, focusing instead principally on operational training and proficiency of small crews and individuals.

FINDINGS FROM THE LITERATURE

In reviewing the literature, the team found remarkably few research efforts relating peacetime operational training to unit proficiency. Considering the sizes of the budgets involved and the importance of the issues, this paucity of empirical research is surprising.

Perhaps the best research has been done in the flying area. The key results are that one can relate flying experience, both career flying experience and recent flying experience, to bombing accuracy, carrier landing proficiency, and air-to-air operations. (See Stanley Horowitz's presentation, which follows.)

There is also some evidence of performance effects for ships. For example, there are research efforts that show that as ship steaming days increase, the probability of achieving C-1 category ratings are higher. But that just means the training syllabi have been completed; it doesn't necessarily mean that capability is higher. There is also some evidence for carrier battle groups that the higher steaming rates are associated with improved target identification and engagement in battle group exercises.

Finally, there are some limited results for Army units. The first concerns a Tank Table VIII gunnery test: individual tank crews go into a range, pop-up targets appear, and the crews are supposed to shoot them. There is some evidence that gunnery performance is related to crews' experience and to experience in different kinds of simulators (UCOFT and SIMNET). Second, the Army Research Institute has some evidence derived from the National Training Center (NTC) that the casualty exchange rate in defensive operations is linked to home station tank optempo, i.e., how much the unit trains before it actually goes to the NTC.

METHODOLOGICAL LIMITATIONS OF PAST RESEARCH

Most studies surveyed had significant methodological limitations in at least one of these areas: performance measures, data, or analysis.

A key problem is that the performance measures are very poor and typically don't reflect what the unit will have to do in case of war. For example, in the Tank Table VIII exercises, a tank crew often gets to preview the range before the evaluation, which is hardly a test of how well the unit will do during war. The reliability and validity of other performance measures are uncertain, especially in judgmental ratings. (Reliability has to do with whether the same result occurs if the crew is run through more than once; validity has to do with whether the test really measures what the crew is supposed to be able to do in war.) Judgmental ratings may be good enough for internal purposes, but they are not adequate for reporting to Congress on proficiency. Another performance measurement problem is that there is limited variance (e.g., high success rates, pass/fail grading). Nobody likes tests where personnel can fail, and so there are very few objective, quantitative performance measures that allow failure.

Even if good performance measures existed, data about training are usually either lacking or grossly inadequate. There are considerable difficulties in getting the relevant training data for a variety of reasons: personnel rotation, poor record keeping systems, lack of specificity about training content, inadequate measures of alternative training inputs such as simulator time, and so on.

There are also a number of analytical issues, one being possible selection effects. Suppose, for instance, that poor pilots tend to leave the cockpit before better pilots. An analyst, observing that more senior pilots are better pilots, might improperly attribute all of the difference to flying training. Alternatively, if poorer pilots are given more flying hours, then the relationship between flying hours and proficiency could be underestimated. Another analytical issue is the case of multiple tasks and missions within fixed resources. For example, if a pilot has multiple missions, then once he reaches a designated threshold in the number of hours he has flown during the month, he may switch over and practice something else. Some flying hours, therefore, are devoted to one mission, and other flying hours are devoted to another.

VIEWING TRAINING RESOURCES BROADLY

Just asking how flying hours/steaming days/combat vehicle miles affect proficiency is not enough. Alternative training resources must also be taken into account. Suppose, for instance, that there were training ranges that could provide more realistic and instrumented ways to examine how the unit would perform in a simulated combat environment. Or suppose the ammunition were very cheap and forces could fire more live rounds than in previous years. Or suppose there were changes made in the major exercises. These are all alternatives that should be taken into account in evaluating what the right optempo would be.

There are other issues as well. In regard to allocation of optempo dollars, for instance, it's not clear that different units are being maintained at different readiness levels in accordance with a priority system. Looking at the reserve forces, the resourcing of reserve units doesn't seem to be closely related to time of deployment. Presumably, DoD would want to try to maintain early units at a higher readiness level than later units.

Additionally, in thinking about resource allocation, it is not just how proficient the unit will be if it is kept at some steady state level of training, but also how long will it take to bring the unit up to full proficiency if it trains at a lower rate during peacetime but is given intensive training at the onset of war. In other words, how fast can a unit get up to full proficiency if dollars are spent quickly at the beginning of a war? If it takes no time to get people fully trained up and proficient, then the optempo issue isn't really a problem. If it takes a long time, then it is a problem.

CONCLUSIONS

There are four basic conclusions of the study. First, DoD needs objective, quantitative unit performance measures; at the present time, it doesn't have those in many functions. This is a particularly difficult problem because there are few hard data, and this leads to the second conclusion: Even if measures of performance can be devised, significant amounts of data on training and other types of resources need to be collected. Future research, therefore, requires collection of broader measures of training and other resource inputs.

Third, the best way to determine the relationship of optempo resources to proficiency of units may be some form of experimentation. Planned experiments have been done in many other areas, even in recruiting and training, but RAND is not aware of

any good experimentation being done in the specific area of operational training and performance of units. Such experimentation should cover steady-state proficiency *and* train-up time.

Finally, DoD needs to provide effective incentives to the Services, because without incentives OSD will not be likely to get the sort of results it needs. In the Services there is strong resistance to conducting these sorts of tests and equally strong resistance to providing this sort of information to OSD.

DISCUSSION

The discussion revolved around five topics: planned experiments, use of Inspector General reports to measure proficiency, use of commanders' evaluations as expert opinion, factors other than optempo affecting unit proficiency, and active versus reserve optempo comparisons.

One researcher reported that SAC is now doing a planned experiment. Specifically, it is giving some crews more flying hours than others and using check-ride kinds of performance measures—that is, having instructor pilots ride along with pilots and grade their performance in great detail. Reportedly, these instructors have been given very specific instructions about how to conduct the evaluation and why they should avoid providing feedback, which might bias the experiment.

Another researcher voiced reservations about planned experiments in general, contending that there are inherent drawbacks to the methodology. Hawthorne effects, for example, are difficult to avoid: if one sets up an experiment with reduced resources and tells a battalion commander that he is participating in it, he is going to substitute other things, such as more hours on the job, in order to make a good showing. Another drawback of a planned experiment in this area is that if it is to measure what is needed, it would have to be very long term and expensive. The alternative to planned experiments would be testing a selection of individuals who have different experience levels.

The question arose of whether the Services' Inspectors General reports could or should be used as measures of performance. One response was that the Services are reluctant to share that information with anyone outside of DoD, and rightly so. The Services use these assessments as internal tools for the commander to get his units in order, and the reports shouldn't be issued as report cards on the commander. A means needs to be devised, it was suggested, to judge the unit without using it as an evaluation of the commander. On the one hand, the integrity of the system must be ensured, and on the other hand, DoD needs to get these data out so they can be used by researchers attempting to assess the overall capability of units.

There was further discussion on how detailed the information from the IG reports must be. One view was that the only information needed is whether the unit is ready or not. The contrasting view was that the information would have to be more detailed because the Services need to know not only whether the unit is ready, but also how much

better it will become if more money is spent on it. There is a set minimum capability, but the Services would like forces to be more proficient than that minimum. The forces should be as good as they can be, given the resources available. And if the resources are changed, what happens? One ought to be able to evaluate the consequences for proficiency of different levels of resources.

On the subject of subjective measures of performance, a Service representative posed the following analogy: A doctor in a trial gives expert opinion—based on training and experience—about a medical matter. Why then can't a commander with 20 years' experience testify to the status of his units? The response was that there are important differences between the seemingly parallel situations. A doctor giving expert opinion does not have a stake in the outcome of the hearing. A commander's budget or his own evaluation by his superiors is at stake, and therefore he cannot be regarded, in terms of evidence, as a disinterested expert. Because of this, quantifiable, measurable indicators of proficiency must be gathered. DoD has not had such data in the past, and therefore there has been considerable dissatisfaction expressed with DoD's inability to rationalize its optempo budgets in terms of the effect of additional dollars on unit proficiency.

It was also pointed out that two other major factors affect proficiency of units: equipment design and the quality of recruits. Both of these have the potential to overcome the effect of variation in optempo.

Several comments addressed active/reserve optempo comparisons. It was noted, for example, that most of the optempo literature concerns optempo variation within the active forces. Optempo variation analysis is lacking between active and reserve units in the same function, where there are large variations in optempos; therefore, the optempo issue needs to be evaluated in active/reserve terms.

Also with regard to the active/reserve context, one researcher stated that a major difficulty has been in trying to model proficiency once it has been achieved. That is, the research team didn't know how to estimate what happens once someone is trained enough to become proficient. What must be done to maintain that level of proficiency over time? This becomes very important when comparing active and reserve forces because it concerns a central argument: if personnel stay in the same job long enough, even though they're only doing it part time, might they not be better than someone else who has spent a short time doing it full time? That whole set of tradeoffs is something that isn't being addressed at all.

The RAND literature survey found very little evidence of that sort of research. The only research that approaches this is that done by Stan Horowitz (see the following presentation) which addresses the relative value of career experience versus near-term experience.

IX. RELATING FLYING HOUR ACTIVITY TO INDICATORS OF OPERATIONAL PERFORMANCE

Stanley A. Horowitz, Institute for Defense Analyses

Congress and GAO have expressed skepticism about the link between flying hours and aircrews' ability to execute missions, and DoD has not been able to justify expenditures in the flying hour program or to demonstrate empirically that cuts in flying would affect observed proficiency. The objective of this study was to develop quantitative relationships between the capability of aviation units to perform at least some of their assigned missions and the number of hours they have flown. The purpose was therefore to improve DoD's ability to justify expenditures in the flying hour program.

The hypothesis was that aircrews who fly more hours perform better in achieving their missions. Specifically, flying hours should affect aircrew performance in two ways: in their short-term proficiency, and in their long-term career expertise. The first reason—maintaining proficiency—is the one used to justify the flying hour program, but the second reason—developing expertise over the course of a career—may also be important.

Although all of this study dealt with the active component, parts of it are specifically relevant to the reserve component as well. For example, on the issue of measuring readiness, the study demonstrates that there *are* indicators of performance available. There is useful information on performance available in the peacetime military that goes beyond SORTS, which simply reflects inputs. Also, this work takes into consideration the value of experience in performance, which is a strength of reservists. In addition, it addresses the link between training programs and performance, which is a major issue in the current force mix discussions.

Three empirical investigations were undertaken: the quality of Navy carrier landings; the accuracy of Marine Corps aviators on bombing runs; and the performance of F-14 fighters in air-to-air combat training.

NAVY CARRIER LANDINGS

The analysis of Navy carrier landings examined 2783 landings between June 1985 and October 1987 by approximately 100 pilots in carrier wing 7, which was deployed on the USS *Eisenhower*. The data analyzed were gathered by the squadrons, not from a central database, and therefore additional information about other aspects of pilots' training, such as simulator training, was not included. The data included landings by a variety of aircraft (F-14, A-6, A-7, E-2C, and S-3), the career flying histories of pilots, and running totals on recent flying.

The dependent variable—the measurement being examined—is based on carrier landing ratings. Every landing on a carrier is graded by a landing signal officer. Grading procedures are tightly specified, and therefore the grades are considered to be objective. Landing grades range from zero to 5.¹ For purposes of analysis, grades were divided into two categories: grades at least as good as 3.0 were considered satisfactory, and those at least as good as 4.0 were considered excellent. The analysis sought to estimate the probability that a landing would satisfy a chosen criterion (either satisfactory or excellent) as a function of the pilot's flying-hour history and other factors.

There was a high correlation between career flying hours and landing grade as well as between hours flown in the last 30 days and landing grade. Both recent and long-term flying experience were found to be associated with better performance. These relationships were statistically significant for both satisfactory and excellent landings. In quantitative terms, a 10 percent decrease in the number of flying hours had the short-term effect of increasing the number of unsatisfactory landings by 3.1 percent and decreasing the number of excellent landings by 2.6 percent. If the decrease in flying hours continued indefinitely, it is assumed that pilots would have 10 percent fewer career flying hours, which would yield a further increase of 7.5 percent in the number of unsatisfactory landings and a further decrease of 2.6 percent in the number of excellent landings. Thus, the total long-term effect of a 10 percent reduction in flying hours was estimated to be roughly 11 percent more unsatisfactory landings and 5 percent fewer excellent landings.

¹The rating characterizations were as follows: 0, dangerous; 1, wave off (the pilot was instructed not to try to land); 2, no grade (a landing was made, but the technique was considered faulty); 2.5, bolter (the aircraft touched down but failed to catch an arresting wire and was forced to take off again); 3, fair pass (some errors, but not dangerous); 4, ok pass (as good as a pilot can realistically expect to get); 5, rails pass (a perfect landing, as if the plane were on rails—very rarely given).

Most of the total effect of a reduction in flying hours was due to its implication for total career experience. Performance was less sensitive to short-term changes in flying hours than to long-term changes. This means that it would be difficult to remedy problems of inadequate performance quickly. If performance is allowed to degrade because of inadequate flying hours limiting overall pilot experience, extremely high operating tempos would be needed to prepare for an emergency. Such operating tempos might not be sustainable because higher use will mean more equipment failures and because of limited training assets such as air combat maneuvering ranges. Therefore, although it seems that considerable money could be saved on flying hours over the long term, such a reduction might result in inadequate preparation for combat.

ANALYSIS OF MARINE CORPS BOMBING ACCURACY

The second investigation measured the correlation between training and bombing accuracy by Marine Corps pilots. Data were obtained from a Marine headquarters database on bombing runs at instrumented ranges between January and July 1987. A total of 650 bombing runs was analyzed, the dependent variable being distance from the target measured in feet. The database identified not only the accuracy of the run, but also the type of delivery (about one-third were manual and two-thirds were automatic), the type of aircraft (AV-8B, which has both kinds of delivery; F/A-18, which has both kinds of delivery; and F-4S, which has only manual delivery), the pilot's place in the training syllabus, and career flying histories as of June 30, 1987.

The results of the analysis indicated that for manual delivery, pilots with more career experience dropped their bombs more accurately, and that greater recent flying experience also is associated with more accurate bombing. A 10 percent reduction in recent flying hours was estimated to increase the distance of missed bombings by 1 foot; a 10 percent reduction in career flying hours was estimated to increase bombing miss distance by 1.5 feet. For automated bomb delivery, more career or recent experience did not appreciably increase bombing accuracy. However, flying hours may affect pilot proficiency in other important skills, such as surviving ground-to-air missiles and air-to-air combat, that are necessary in order to deliver bombs. Additional flying hours, however, affected the bombing accuracy of automated bomb deliveries very little.

ANALYSIS OF NAVY AIR-TO-AIR MISSION

The study investigation measured the correlation between Navy pilot flying hours and pilot performance in air-to-air engagements. Data on Navy air-to-air combat training were taken from the Fleet Fighter Air Combat Readiness Program (FFARP), which every Navy F-14 squadron must participate in every 18 months. Navy "blue" pilots fly missions against highly trained Navy "red" pilots who simulate Soviet tactics; typically, red aircraft outnumber blue in a mission, the engagements progressing from two on two to four against many. A system monitors signals from all the aircraft in a mission, tracking shots and determining whether there is a hit or a miss. The current analysis was based on almost 2000 missile shots and gun firings.

There are two crew members in an F-14, a pilot and radar intercept officer (RIO), but the database identified each crew member on each mission. Average pilot experience was 1727 hours (ranging from 387 to 4186), and average RIO experience was 1314 (ranging from 226 to 3772). Pilots' average flying hours the previous month were 21 (12 to 38), and RIOs' average was 18 (4 to 38).

The analysis was performed at the crew level (sortie level), and the performance measure—the dependent variable—was net kills (blue kills minus red kills). Two models of performance were used. The first focused on four flying-hour variables to explain the variation in net kills: long- and short-term experience for pilots, and long- and short-term experience for RIOs. In this analysis, only the long-term experience of the pilot appeared significant. The results suggest that a 1000-hour increase in pilot flying hours is associated with 0.13 more net kills per sortie, or one more kill every eight sorties.

Because kills also depend on pilot and RIO performance in locating the target, the model next depicted a formulation of net kills as determined by experience and proficiency *in locating aircraft*. This proficiency is measured by tally range, the distance at which the enemy is first seen either visually or via television. Tally range is influenced by both the recent and career experience of the pilot and the RIO. In this indirect performance formulation, it was found that all four flying-hour variables significantly affected tally range. A 10 percent increase in all the flying-hour variables can be expected to increase net kills by 5 percent. Increased pilot experience (recent and career) accounts for 86 percent of this effect, and 76 percent of that is due to increase in the career experience of pilots and RIOs; only 24 percent is the result of increased recent flying time.

CONCLUSIONS

Results from the study of three missions for Navy and Marine aircraft indicate that quantitative relationships can be developed statistically. The conclusion was that both long- and short-run flying hours affect proficiency: more flying hours result in measurably better performance. The long-run effect, however, is stronger and more consistent than aircrew's recent experience.

The analysis also sought to determine the impact of a 10 percent reduction in flying hours on performance. A 10 percent reduction in recent flying hours was estimated to increase unsatisfactory Navy carrier landings by 3.1 percent, increase the distance of missed bombings by one foot, and decrease air-to-air combat net kills by 1.2 percent. A 10 percent reduction in career flying hours was estimated to increase unsatisfactory landings by 7.5 percent, increase bombing miss distance by 1.5 feet, and decrease air-to-air net kills by 3.8 percent.

DISCUSSION

One conclusion of the study was the subject of considerable debate: that the marginal effect of long-term, or career, flying hours is more important than the marginal effect of short-term flying hours. Several participants questioned the interpretation of the statistical results and suggested that an alternative conclusion about the relative importance of long-term versus short-term flying hours might be more accurate. Although they agreed that the cumulative effect of career flying hours is more important than short-term flying hours, that is because the typical pilot's number of career flying hours is so much larger than his number of short-term flying hours. The statistical equations clearly indicate that the effect of one more flying hour is greatest in the short term.

The equations, they argued, suggest that recent flying is in fact very powerful: an hour in the near past affects performance more than an hour in the more distant past. According to the equations, one could get the increase in performance level, maybe considerably cheaper, with the recent flying. If a pilot isn't given significant amounts of flying training over his career, the data suggest that when that pilot is needed, the Navy should simply turn the training on and make him practice extensively.

The reply was that the data need to be studied further, but that the career flying hours seem to be the more important. The rationale was that career flying is so much a part of the pilot's performance that it would take a tremendous amount of short-term flying to get a pilot up to the required proficiency level. Also, it may be very risky to rely on waiting until there's a crisis and then trying to train up.

The Service viewpoint was that there is a certain amount of seasoning one gets over a career, just like out on an interstate highway. If a car driver gets two weeks of intensive training, he can probably survive the first day, maybe even the second day, but soon he will make a mistake based on his inexperience and end up in a crash. But over the course of a long driving career, one develops an awareness of the environment and of the automobile that protects him—and the driver next to him. That awareness is difficult to quantify.

Most participants seemed to agree with this logic, but it is not inconsistent with believing that a flying hour recently flown has a greater effect on proficiency than a flying hour flown in the distant past. The results of the study *do* substantiate the view

that a 10 percent increase in career flying hours would have a much greater effect on performance than a 10 percent increase in short-term flying hours. This is because 10 percent of career flying hours is a much larger total number than 10 percent of short-term flying hours.

Another Service comment was that generalizations about flying experience based on one scenario may not be accurate.

A final comment concerned a possible selection bias. How can one differentiate between the longevity effect having to do with training instance and the longevity effect of getting a pilot out of the system? This was a known selection bias in the study. Presumably, the pilots who are better pilots are more likely to stay in the cockpit, so it may be that those who are currently the more experienced pilots were always better than their contemporaries who left the cockpit. Whether or not this is correct has obvious relevance from the point of view of justifying the flying-hour program and for thinking about the differential experience levels of active versus reserve pilots.

X. FORCES, READINESS, AND MANPOWER INFORMATION SYSTEM (FORMIS)

Colin Halvorson, Logistics Management Institute

There are many ways to support decisionmaking, and numerous tools have been built specifically for this vital activity. Decision support systems can support such things as identifying key issues, allocating resources, generating practical solutions, responding to challenge in a timely manner, measuring progress, and making policy. Over the years, the Logistics Management Institute (LMI) has become aware of the need for another decision support system, one that pulls into one place several existing databases on forces, readiness, and manpower.

DEVELOPING A PROTOTYPE SYSTEM

LMI is in the policy business, not the system building business. Nevertheless, the Institute is developing a new support system called FORMIS: Forces, Readiness, and Manpower Information System. The reason for building this system, which is still in prototype form, was that factual information necessary to arrive at manpower and personnel policy recommendations was not easily available. Since the necessary data were not in a unified system, LMI was forced into creating such a system.

FORMIS has several unique characteristics. For example, it contains manpower requirements/authorizations, personnel inventory data, and resource ratings in a single system. It also puts into one system data on active, reserve, and defense civilian personnel. In addition, it links manpower data and readiness to war plans, identifies skill mismatch problems, and tracks force structure subsets over time.

FORMIS not only pulls together these data, it also puts them into a PC-based system that allows an analyst to retrieve information quickly. In the past, mainframes were thought to be the only tools that would be able to do these sorts of activities, but FORMIS works on any IBM-compatible personal computer that has a minimum 40-60 megabyte hard drive.

FORMIS ARCHITECTURE

As shown in Fig. 8, FORMIS consists of five data files. The DMDC (Defense Manpower Data Center), which is an existing entity, gathers the information from the Services. Instead of creating new data, LMI decided that the existing data should be used, and therefore FORMIS uses such databases as SORTS (Status of Resources and Training System), unit files, and existing personnel data files.

One file within the system is manpower authorization. Another is personnel inventories, which has data on the number of personnel and their skill and grade. Two other files relate to readiness—SORTS data and unit directory. They allow a person to look at units in terms of resource status. The unit directories tell what units are in the system and in what kind of form. Finally, there is a FYDP manpower file so one can retrieve, display, and examine the FYDP for any year. All the data are by budget year, but there are updates more frequently than annually.

Figure 9 shows how the data files are organized into four analytical modules.

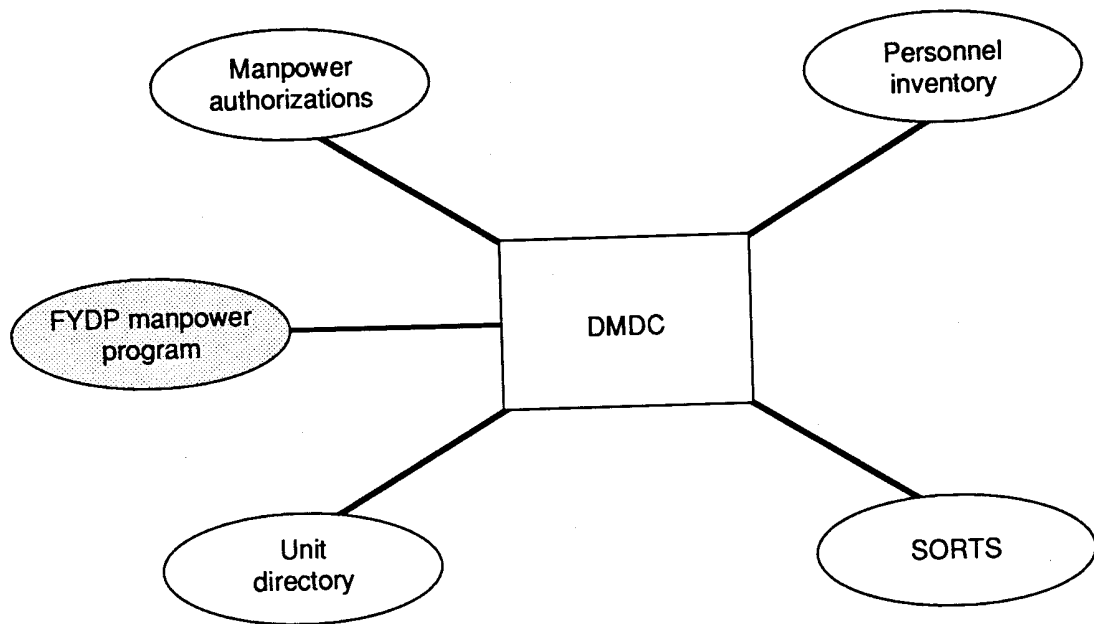


Fig. 8—FORMIS architecture: data files

Readiness	Force structure	Manpower	FYDP
Units	Unit	Unit	FYDP manpower
SORTS	Authority	Authority	Authority
	SORTS	Personnel ^a	
		SORTS	

^a Active Duty Master Files, RCCPDS, and Civilian Personnel file.

Fig. 9—FORMIS architecture: analysis modules and DMDC data files

FORMIS OBJECTIVES AND CAPABILITIES

The objective of FORMIS is to permit analysts to perform either total force structure analysis (e.g., unit composition, balance between active and reserve resources, balance between military and civilian authorizations, use in various contingency and war plans, and resource ratings of units) or total force manpower analysis (e.g., comparisons of authorized and assigned strengths, match between manpower skill requirements and personnel assets, match between authorized and assigned grades, and manpower distribution).

As a decision support system, FORMIS has multiple uses. For example, it can help one to identify issues, make a policy, justify it with data, and allocate resources. It also allows a policymaker to prepare for a readiness council or for testimony, since the system provides information on how things stand today. Furthermore, by putting information at one's fingertips, it allows DoD to answer congressional or internal queries in a very short period of time.

FORMIS has the ability to run through a vast number of records very quickly and give an aggregated answer. Then one can peel back the layers and look at subcomponents to see beneath the aggregated answer. Instead of looking at the Army, for instance, one could look at some subcomponent of the Army, perhaps a unit in the Army, and then maybe some subcomponent of that unit, in terms of its manpower or force structure.

Each module is intended to serve specific objectives, as follows:

- *Readiness module objectives.* The readiness module is intended to give analysts routine and automated access to SORTS data for all Services. One objective of this module is to make unit resource and training status a part of total force policy initiative and force mix decisions. Another objective is to track the effectiveness of programs designed to address specific unit resource and training problems.
- *Force structure module objectives.* A primary objective of this module is to give analysts routine and automated access to force structure information: the numbers and kinds of units in each service and component; the distribution of manpower authorizations among officers, enlisted, and civilian forces; and the relationship between wartime required and peacetime authorized manpower in the force structure. The second objective is to assist in the development of total force policy initiatives and the review of force mix decisions.
- *Manpower module objectives.* The manpower module is intended to give analysts routine and automated access to Service manpower data, specifically, military and civilian manpower authorizations by grade and specialty, and military and civilian personnel inventory. In addition, this module assists in the analysis of manpower distribution and balance by comparing authorized and assigned strengths, matching manpower skill requirements and personnel assets, and matching authorized and assigned grades.
- *FYDP module objectives.* The final module gives analysts routine and automated access to FYDP manpower data. Such data assist in the analysis of changes to the FYDP manpower program, both year to year within the same FYDP and between different FYDPs. It also assists in the analysis of differences between FYDP and Service Billet Plans. Budget execution analysis, however, is not yet available.

IMPLEMENTATION AND EVOLUTION

This is fundamentally what is in FORMIS, though it is not all that will eventually be in it, as the system is continually evolving. At present, part of the system is up and running, but it will not be fully functional until 1991. Two of the modules are completed—readiness and FYDP—across all Services. The force structure module is done for the Army and the Air Force. The Navy and Marine Corps data are scheduled for completion in October 1990 and March 1991, respectively. The manpower module is completed for the Army and is scheduled for completion for the Air Force in August 1990, for the Navy in February 1991, and for the Marine Corps in June 1991.

One of the advantages of FORMIS is that the system can be added to and modified, so that whatever data a user wants can be put in fairly easily. LMI is exploring what other modules should be incorporated, how to make best use of the data, and how to include more data by condensing them to a manageable size. A major challenge has been to make the data fit into smaller places and still get to them and work faster. For example, a POM year used to require about 10 megabytes; it has now been crunched down to about 2 megabytes.

DISCUSSION

Several questions arose regarding the data, the uses, and the availability of FORMIS. One issue raised by several participants was the reliability of the data within the system. Since the data come from the Services, their usefulness will depend on their quality. It was noted that although DMDC is becoming the official repository of all data relating to manpower, it is in transition and is just now building up that capability, and it will be a while before it is up to speed. DMDC is the primary data source because, even if it is not perfect, the data in those databases are as good as any that exist having to do with official, approved force structure within DoD. Some Service representatives, nevertheless, expressed the feeling that although the data are no *worse* than other data, they are not more dependable either. Some participants felt that there are significant quality problems with the data in those databases, or with the data processing network. Consequently, it was felt, one cannot have high confidence in the data retrieved from those databases. At least one service headquarters does not use those data, and therefore it does not see their applicability.

LMI is aware of various parties' concerns about the data. They expressed concern with what is displayed and indicated they are trying to work through everyone's concerns.

Other participants suggested that, despite reservations about the reliability of the data, the system offered tremendous advantages and can help to improve data reliability. One of the advantages of the system is uniformity of data. With a system such as FORMIS, everyone is using the same numbers, and therefore there is no disparity.

A related issue was the type of data used in various modules, such as the manpower authorization module and the readiness module. There was also some reservation about the reliance on data for what has been authorized instead of what is required. Using authorization data was considered by some participants as being of less utility. LMI said that FORMIS gives both types of data. Everyone wants to know, from a readiness or warfighting capability, what the U.S. current asset position is with respect to the full-up TO&E (table of organization and equipment). Are we 10 percent short, 20 percent short, or what? That is the SORTS data. Unit readiness, several participants contended, should be measured against manpower requirements, not against what was authorized. LMI explained that both manpower requirements and manpower authorizations are in FORMIS.

The question of whether the readiness module is equated with SORTS was a recurring one, for many participants contended that SORTS doesn't measure readiness. Some expressed the opinion that calling a module "readiness" that contains only unit data and SORTS is misleading. The reply was that it's a readiness module, not a SORTS module. SORTS is one part of it, but that is not the only input. FORMIS is intended to provide WARMAPS data in the future when the Joint Staff provides it, and that will be used as another measure of readiness.

The question arose as to whether the modules can talk to each other. At present they do not, but the paradigm is not limited by what has already been done. The modules can be made to talk to one another. Currently, a user can pull up any one of the modules on a screen, get information, and then pull up another module and look at its data.

Another issue about FORMIS was whether the Services would have access to it. Although that decision has not yet been made, the expectation is that the Services will indeed have access to it. In this respect, FORMIS is comparable to RUPS (Reserve Unit Priority System), which was built for Reserve Affairs and which RA passed along to the Services. The same will likely happen with FORMIS. When it is eventually exported, it can be exported on tape, floppy disk, or hard disk. It is not being exported currently because the system is still a prototype. As with RUPS, once FORMIS is turned over to the Services, it is expected that they will find great use for it and that it will prove beneficial.

XI. PERCEIVED CONSTRAINTS TO UNIT READINESS: EVIDENCE FROM THE 1986 SURVEY OF RESERVE FORCES

David Grissmer, RAND

There are numerous sources of information on reserve readiness, including SORTS, budget information, case studies, expert opinion, anecdotal data, and large-scale surveys. This presentation reports on the preliminary analysis of a RAND study that is using data from the 1986 DoD Survey of Reserve Personnel to examine readiness. The survey was in some respects a follow-up to a survey RAND conducted of Army personnel in 1979, except that the current study surveyed all six reserve components.

OBJECTIVES

The objectives of the study are to see if unit personnel perceptions of readiness changed from 1979 to 1986, and to see if the various components differed in either the *pattern* of perceived problems or the *level* of problem seriousness. By examining what personnel in reserve units consider to be constraints to the training readiness of their units, the research team is seeking to determine what kinds of difficulties exist across the components, what different kinds of difficulties exist in occupations/missions (e.g., combat support units, maintenance units), and whether people within the same unit perceive the problem differently (i.e., are there differences in perceptions between officers and enlisted personnel, or between personnel with prior and nonprior active service?).

Another research objective is to analyze the data in a way that will develop a "theory" of training readiness in order to explain why some units seem to be ready and others seem not to be. A final objective is to test whether improved survey data can be used as a better diagnostic tool for both readiness assessment and resource allocation.

APPROACH

The 1986 survey of reserve forces was a large-scale survey given to personnel in all six reserve components: Naval Reserve, Marine Corps Reserve, Air Force Reserve, Army Reserve, Army National Guard, and Air National Guard. The data are from about

5600 officers and about 24,600 enlisted personnel—about a 1-in-20, 1-in-30 sample—across the reserve forces.¹ The survey was administered in May and June 1986, which was before much of the equipment modernization reached the reserve forces.

Strengths and Weaknesses of Survey Data

The researchers realize that survey data have definite weaknesses and should be used as only one data point that helps inform the decisionmaking process; however, such data also have significant strengths that should not be undervalued.

One of the advantages of large, random surveys is that they assess and compare different viewpoints within the unit—e.g., both officers and enlisted members. Second, they allow systematic comparisons across types of units and components. Third, they partially protect against various kinds of organizational and political bias, which comes with readiness ratings, for example. Fourth, they can be analyzed statistically to determine magnitudes and confidence intervals. And fifth, there are advantages of flexibility in survey design; a survey can be tailored to different types of units and forces to address a variety of issues and differences among subjects.

Survey data have inherent weaknesses as well, some of which can be overcome with statistics, and some of which cannot be. One weakness is that answers may reflect the individual's bias rather than an objective condition. There is also what is called observer bias—that is, the individual's position in the hierarchy—and the researchers have tried to control for some of this bias. Specifically, they have taken a typical observer—an E-6 in this case—and placed that typical observer in each unit and corrected for all the bias that could be discovered through the survey data. The probability that the typical observer, the E-6 in each unit, would check an item as a serious problem is plotted.²

Another weakness of this survey, given that the research team is trying to expand the data into a resource allocation framework, is that the survey just identifies the problems; it doesn't give respondents choices about where additional funding should be

¹The survey data have been supplemented with some authorization data for the Army and some personnel data.

²Using a typical observer can result in a certain parochialism of viewpoint, since an E-6 is more sensitive to some issues—such as the shortages of E-1s and E-4s—than to other issues. However, there was surprisingly little variation between officers and enlisted personnel in ranking problems, and the results would not change appreciably if the typical observer were an officer.

spent. A final weakness of survey data in general is the possibility of nonresponse bias, part of which has been corrected for.

The Survey Question

Of the many questions asked on the survey instrument, this presentation focuses only on the question concerning individuals' perceptions of the constraints to meeting their unit training objectives. The researchers analyzed differences by occupation, by officer versus enlisted personnel, and by component; the results presented here focus primarily on components.

The particular survey question of special interest to this colloquium was: "How much of a problem is each of the following for your unit in meeting your unit's training objectives?" Fourteen reasons were then listed that might be constraining units in meeting training objectives, and reserve personnel were asked to assign a rating of 1 to 7 to each constraint—a "serious problem" to "not a problem." Of the 14 items listed on the questionnaire as being potential problems in meeting readiness, the researchers recorded each person's indication of the two most serious problems.

The "complaint" choices were grouped into four categories: capital investment, O&M resources, time constraints, and personnel constraints. The first group of choices, those fixed by capital investment, included out-of-date equipment/weapons and lack of access to good training facilities and grounds. The choices that addressed O&M resources were: poor mechanical condition of equipment/weapons; lack of supplies, such as ammunition and gasoline; and lack of good instruction manuals and materials. The time constraint choices on the survey instrument were: not enough staff resources to plan effective training; not enough time to plan training objectives and get all administrative paperwork done; and not enough drill time to practice skills. And finally, there were six possible personnel constraints listed: shortage of personnel in grades E-1 to E-4; low attendance of unit personnel at unit drills; shortage of personnel in grades E-5 to E-9; shortage of MOS/rating/specialty qualified personnel; low quality of personnel in low-grade unit drill positions; and low attendance of unit personnel at annual training/ACDUTRA.

PRELIMINARY FINDINGS

From the data gathered, a number of preliminary observations can be made about the changes in perceived problems from 1979 to 1986, the pattern of perceived problems, the differences in degree of seriousness among the components, and the relationships among the problems.

Changes from 1979 to 1986

When the 1979 and 1986 survey responses were compared, the data showed declines in personnel-related issues and increases in training-related issues. The most dramatic differences were that in 1979 the E-1/E-4 shortage was considered much more significant, which corresponded with factual data showing that the unit levels were about 75 percent in 1979. The force in 1979 (Army Guard and Reserves) was about 750,000, and by 1986 it had been increased to 1.1 million. One possible explanation here is that as personnel problems were solved, more emphasis was placed on training issues, making personnel more aware of training deficiencies.

Similarity in Pattern Among Components

The pattern of items checked as serious problems in meeting training objectives in 1986 is consistent across the reserve components. *In general, equipment and training facilities and administrative paperwork come out as the most serious problems in all components.* Supplies, repair, drill time, and E-1/E-4 shortages—the only personnel item mentioned as a serious problem—tend to follow as the next most serious problems. The most significant time constraint is perceived to arise from administrative workload. To alleviate this problem, more capital investment in more efficient administrative systems may be warranted, and additional labor resources may help. Time constraints for skill practice are significant but less binding than many other constraints. Personnel constraints (except for junior personnel) are usually not binding and can probably be solved more easily.

Different Degrees of Seriousness Across Components

Although the pattern of most serious problems remains similar across the components, the *level* of the seriousness of the complaints varies considerably. The percentage of serious complaints for the typical E-6 rises progressively from the Air Force Reserve through the Air National Guard, the Marine Corps Reserve, the Army

National Guard, the Army Reserve, and the Naval Reserve, which had the highest percentage of probable complaints of all the reserve components.

As shown in Fig. 10, the highest mention of serious problems is in the 25–30 percent range for the Air Force reserve. In the Air Guard, the highest mention of serious problems was in the 30–40 percent range. The level continues to rise into the 40 percent range for the Marine Corps Reserve and the Army Guard; the only difference in those two components is that the E-1/E-4 shortage becomes more severe. For the Army Reserve, the top problems are in the 50 percent range, and the administrative problem is the most severe, though the E-1/E-4 shortage isn't as much of a problem. The Naval

A. Out-of-date equipment/weapons	H. Not enough drill time to practice skills
B. Lack of access to good training facilities and grounds	I. Being below strength in Grades E-1—E-4
C. Poor mechanical condition of equipment/weapons	J. Low attendance of unit personnel at Unit Drills
D. Lack of supplies, such as ammunition, gasoline, etc.	K. Being below strength in Grades E-5—E-9
E. Lack of good instruction manuals and materials	L. Shortage of MOS/Rating/Specialty-qualified personnel
F. Not enough staff resources to plan effective training	M. Low quality of personnel in low grade unit drill positions
G. Not enough time to plan training objectives and get all administrative paperwork done	N. Low attendance of unit personnel at Annual Training/ACDUTRA

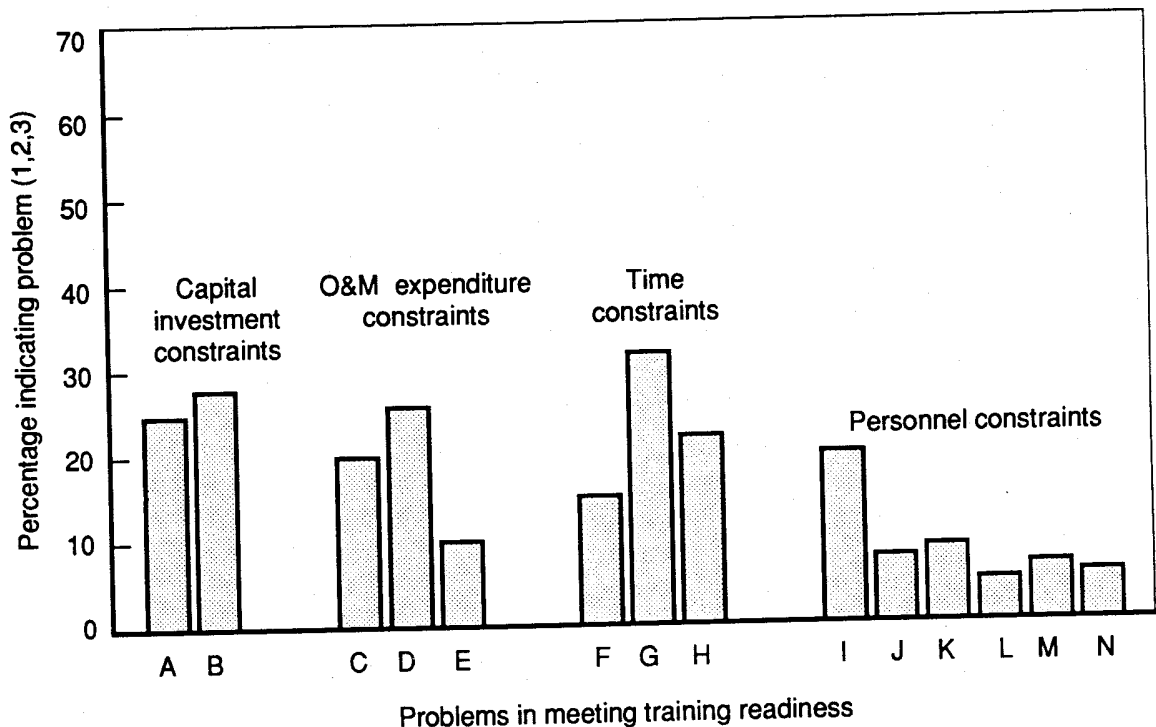


Fig. 10—Air Force Reserve: serious problem mention (E-6)

Reserve (see Fig. 11) had the highest level of serious problems, with training facilities listed as the most severe problem.

When one looks statistically at differences among units, most of the variance in level of complaining is explained by differences among the components, not by occupational differences. The data did indicate, however, that personnel in longer-training-time skills (such as electronic repair, intelligence, communication, medical, and maintenance) perceive more severe training readiness problems than other personnel,

A. Out-of-date equipment/weapons	H. Not enough drill time to practice skills
B. Lack of access to good training facilities and grounds	I. Being below strength in Grades E-1—E-4
C. Poor mechanical condition of equipment/weapons	J. Low attendance of unit personnel at Unit Drills
D. Lack of supplies, such as ammunition, gasoline, etc.	K. Being below strength in Grades E-5—E-9
E. Lack of good instruction manuals and materials	L. Shortage of MOS/Rating/Specialty-qualified personnel
F. Not enough staff resources to plan effective training	M. Low quality of personnel in low grade unit drill positions
G. Not enough time to plan training objectives and get all administrative paperwork done	N. Low attendance of unit personnel at Annual Training/ACDUTRA

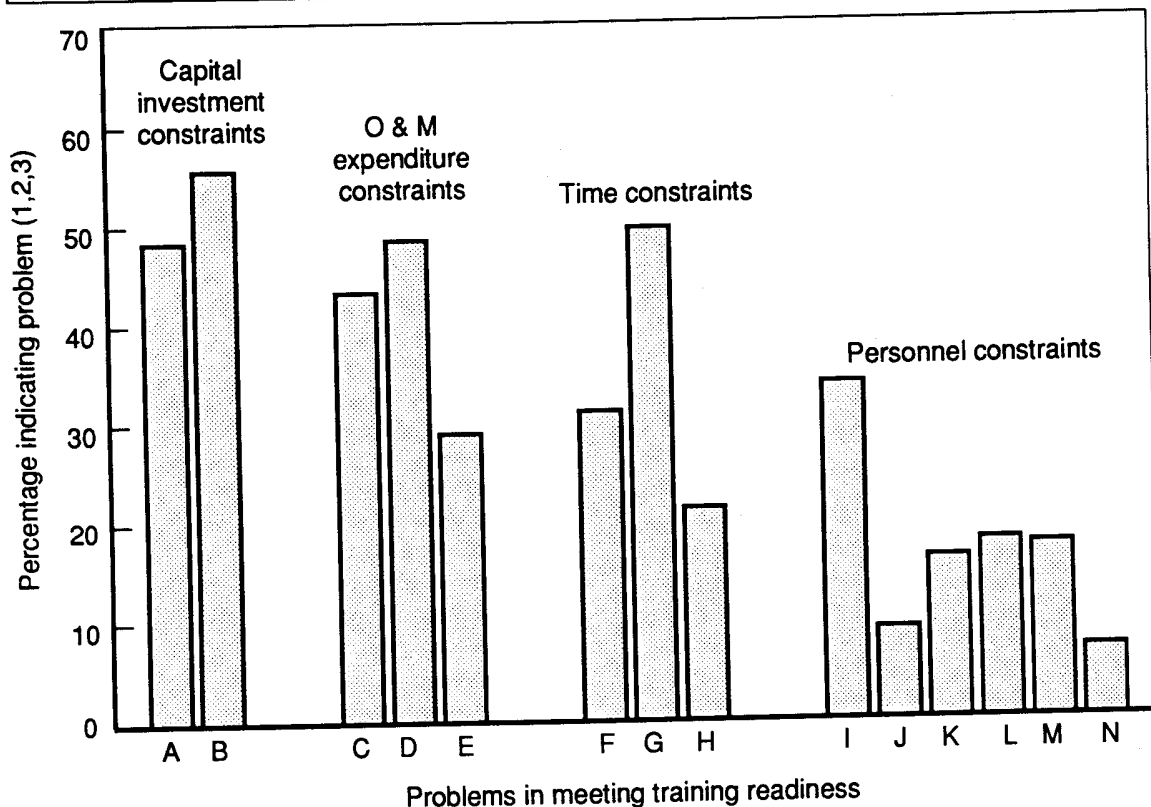


Fig. 11—Naval Reserve: serious problem mention (E-6)

and this is not surprising. Another noncomponent difference was that reserve units located near active bases have significantly lower perceived readiness problems.

The rankings did not vary much, depending on who in the unit was asked. Officers and enlisted personnel had essentially the same perceptions of problems, with the exception that officers listed paperwork more frequently. Nor was there appreciable variation between personnel with and without prior active service, though prior service personnel did tend to view skill levels as more of a problem.

Equipment-Location Relationship

As indicated above, lack of investment in equipment and training facilities is perceived as the most significant constraint. Equipment and training facilities appear to drive other factors, for when good equipment and training facilities are available, other factors tend to also be perceived as good. In the end, however, what will drive equipment investments is location and whether it is cost-effective to provide equipment and training facilities for every unit. Investment in facilities and equipment may not be feasible or cost-effective for units in all locations, especially in Army units, many of which are isolated.

A significant number of units may not be sustainable in their present locations under reasonable investment guidelines. The combination of location-equipment investment is the crux of the problem of how much more ready reserve units can be made. DoD tends to think of location mainly in terms of demographic concerns rather than demographic *and* training. The current viewpoint is fairly narrow: put units where there are good demographics and do not worry about investment needed in terms of training facilities. The latter is a more important concern.

POLICY ISSUES

If one believes what military personnel report on these questionnaires—and that is a big "if"—these data have important policy implications. First, it appears that non-air components are seriously overcommitted or underresourced in both investment and O&M. Second, a major long-term location/relocation strategy needs to be developed to prudently prioritize equipment and facility investment budgets. That strategy needs to: include both personnel demographic concerns and training needs; integrate active and reserve basing policies; take advantage of the location of specific civilian sector skills;

take advantage of economies from regional specialization (concentrations, for example, of electronic repair, computer repair) and eventually locate units in these areas; and protect the strategy from political concerns.

DISCUSSION

One question was whether the survey results would be compared with readiness data. The answer is that the RAND research team plans to merge survey data with C-ratings, which are the data in SORTS.

One comment was that since the reserve components in the last ten years have added full-time staff to alleviate much of the paperwork burden of reservists, it's odd that reservists still perceive administrative paperwork as a major problem. The explanation is that although much of the administrative paperwork is being done by full-time staff, much of it cannot be delegated.

The question arose as to whether there is much variation across units, or if one can tell from these data. The reply is that there is variation by unit. Patterns across occupations change some, but the basic pattern holds. There is some variation in pattern, however, between the high-skill units and the low-skill units.

Another comment was that looking at these survey data along with readiness data corroborates the preliminary findings expressed here about a correlation between equipment and perceptions of other readiness factors. If one looks at SORTS data, it says there is a correlation between those units—and components—that had good equipment and readiness levels. At the time of this survey, the components that had the most equipment problems also had a higher percentage of complaints across the board. The Air Force Reserve perception of unit readiness tends to be high, the Army, low. There is a direct correlation between these survey data and C-ratings.

Issue was taken with the implications of the data in regard to MOS qualification. The data suggest that MOS qualifications are a problem, and the implication is that the reserve component personnel are not qualified. In fact, most personnel *are* MOS qualified, but not in the occupation they're assigned to. The most common reason for this is that prior-service personnel join reserve units that don't have their particular specialties, and therefore they are assigned to other jobs for which they haven't been trained.

Several comments addressed the differences in the forces between the 1979 and 1986 time frames. One person observed that the major change has been in training requirements, which have sharply increased to match the missions. Another difference is that in 1979, reservists were paid for 38 to 39 days of training; now, reservists are budgeted for about 50 days a year, and NCOs and officers are doing more than that.

XII. THE TRAINING STATE OF ARMY COMBAT SERVICE SUPPORT UNITS

John Metzko, Institute for Defense Analyses

The Institute for Defense Analyses (IDA) initiated this study for the Office of the Assistant Secretary of Defense (Reserve Affairs). The study responds to a concern expressed by Reserve Affairs in 1985 that the combat service support (CSS) units, which are a dominant part of the Army, are inadequately trained.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of the study was to assess the state of training in the Army Guard and reserve units in relation to that of the active units in the Army. Of the four items in unit readiness reports—personnel, equipment on hand, equipment readiness, training—this study focused only on training, though equipment availability for training purposes was also considered. To assess the readiness of units, IDA relied on commanders' assessments, as reported in the Units Status and Individual Reporting system (also known as SORTS). IDA selected five of the eleven CSS branches (Composite Service, Logistical Command, Ordnance, Quartermaster, and Transportation) and examined the readiness of units in those branches as of April 15, 1986. Approximately 25 to 30 percent of the Army (in terms of units) is in those five branches.

TRAINING SHORTCOMINGS CITED BY COMMANDERS

IDA examined 398 active units, 434 Guard units, and 508 reserve units to determine the number of each having a rating of 1 or 2 (i.e., combat ready); the numbers, however, are considered confidential and therefore cannot be released in this paper. When a unit does not attain a readiness rating of 1 or 2, the Army requires the commander to fill out a questionnaire citing the main reason for not being combat ready. There are 50 items on the questionnaire, and the commander must choose one and only one primary reason.

Commanders in all components cited shortage of equipment as a major training deficiency. Another deficiency cited was shortage of technically skilled personnel, and a

third was insufficient numbers of supervisors to teach unskilled personnel in both the Guard and the reserves. There was no explicit indication that lack of training apparatus (as opposed to TO&E equipment [table of organization and equipment]) is a problem.

LENGTH OF TIME TO ACHIEVE READINESS

The study also looked at how long (in terms of weeks) it would take the units that were not at level 1 or 2 to get to that readiness level. (The exact figures are confidential.) It should be remembered that these are the commanders' assessments of how long it would take. There was less than a week's difference between the average for the active Army and the average for the Army Guard, and only 1.5 weeks' difference between the active Army and the Army Reserve. (The precise averages, as well as the raw data, are confidential.)

These differences are extremely small. One hypothesis that would explain the small differences is that the reservists and guardsmen transfer skills from their civilian jobs to their military jobs. A search for data to support (or reject) this hypothesis involved looking at training times of different parts of the Army, viz., armor, artillery, and infantry. The combat arms branches contain jobs for which civilian-to-military skill transfer is expectedly low. With those units, the training times (in the estimation of the commanders) required to achieve a readiness level of 1 or 2 were greater than for CSS units. When the training times required to reach combat readiness for the CSS and the combat arms are compared, the combat arms estimates are three times longer for guardsmen than for the active forces, and twice as long for reservists as for the active forces.

ACTIVE VERSUS RESERVE COSTS

If one accepts these ratios, they may be extended to a consideration of the economics of the reserve forces versus the active forces. To pursue this connection between readiness and economics, IDA picked one unit from each of the five branches (not a random selection). It was determined that the annual recurring cost of a reserve component unit compared to an active component unit with the same TO&E was .22; in other words, the reserve unit's annual recurring cost is 22 percent that of the corresponding active unit.

To determine potential savings from converting active CSS units into the reserve component, IDA used three figures: the number of CSS units to be converted, an annual recurring cost of \$6.05 million per unit, and the 22 percent cost ratio of reserve to active. If, based on this formula, 100 of the 398 active CSS units were converted to the reserve components, significant savings would have been realized in FY87, 88, and 89 (again, the figure is confidential).

SAVINGS COULD BE USED TO IMPROVE READINESS

The money saved by shifting units into the reserve component could then be put back into the reserves to correct the deficiencies noted earlier. This would presumably reduce the number of weeks it takes a reserve unit to reach a 1 or 2 level of readiness and thereby achieve greater training parity with corresponding active units.

DISCUSSION

The discussion centered primarily around data and methodological questions. Many participants felt that the commanders' assessments of unit readiness might be biased and that such data thus may not be a reliable source on which to base analytic conclusions. The data are in essence commander self-assessment report cards and are not backed by standardized, objective criteria. The other three resource areas in SORTS are more reliable because they are arithmetic and quantitative and based on formula calculations.

Because the commanders' assessments are part of SORTS, that system was the subject of discussion as well. Most participants agreed that although SORTS tells what resources are available to units, it doesn't predict how well those units will perform. The general feeling was that analysts should be cautious about using C-ratings as a predictor of how well units will perform.

A second major methodological question was about the economics. Some participants indicated they thought that trying to do a cost-effectiveness analysis without first seeing what has to be forward deployed and what has to be kept for a rotation basis will give false economics. In other words, the requirements must be decided up front.

Another concern expressed was that the data do not correlate readiness with contingency plans. One would like to believe that the units that could reach a rating of 1 or 2 the fastest would be those that would be deployed the earliest, but the data do not indicate this. If a unit will be required to deploy in two weeks, for example, and it will not reach a training state of 1 or 2 for five weeks, then it has a capability problem; but if that unit will be ready in five weeks, and it's required to deploy in five weeks, then it is meeting its requirement.

The question was raised also of whether readiness levels mean the same for the active and the reserve components, the implication being that active personnel may need to achieve a higher state of readiness. As an illustration, it may take an active unit two weeks to reach level 1 or 2, and when it does it will be truly capable; it may also take a reserve unit two weeks, but even when it achieves that level, it may not be truly combat ready. Some felt the readiness ratings are less meaningful in the reserves than in the actives.

XIII. RESERVE COMPONENT COMBAT SERVICE SUPPORT TRAINING STRATEGY

Ed Simms, Logistics Management Institute

The reserve component training strategy is a fundamental issue that must be understood before DoD can feel comfortable about shifting missions from the active to the reserve components. If there are significant differences between the active and reserve training environments—i.e., locations, training time, training facilities, etc.—then it follows that the training strategies should also be different. The purpose of this presentation was to share LMI's research on some of the differences between the reserve and active training environments and the issues associated with those differences.

SCOPE

The scope of the study, which was conducted in the mid-1980s, was limited to individual enlisted training for technical skills in the selected reserve. For each of the four Services, LMI examined seven logistics specialty skills that would typically be described as combat service support. A detailed analysis was conducted of who occupied the billets, what skills were required of them during wartime, and what training programs were in place to ensure that they had proficiency in these skills. The billets were such positions as machinist, engine mechanic, electronic technician, automotive repairer, radio technician, etc.; the positions were not identical among the Services. The active/reserve percentage of those billets in 1985 is presented below in Table 1.

Table 1

LOGISTICS SKILLS MANPOWER TOTAL FORCE MIX

	Active	Reserve
Army	48%	52%
Navy	82	18
Air Force	73	27
Marines	80	20

Of the individuals in the reserve components in the selected billets, the large majority were high school graduates (ranging from 84 percent in the Army to 98 percent in the Air Force). The percentage of individuals who had prior active service *in a related skill* was 6 percent in the Army, 16 percent in the Marines, 37 percent in the Air Force, and 64 percent in the Navy.

KEY DIFFERENCES BETWEEN ACTIVE AND RESERVE TRAINING ENVIRONMENTS

LMI found three key differences between the active and the reserve training environments: similarity of peacetime duties to wartime missions, time available for training, and unit location.

Wartime Mission Workload During Peacetime

The first difference between the active and reserve training environments is that the reserves do not, on a daily basis, perform tasks during peacetime that correspond closely to their wartime mission.

Time Available for Training

The second difference is that there are significant time constraints on reserve training. The first type of time constraint is the overall time for training, which is 39 days per year. Only a limited amount of training can be accomplished in that period. The second constraint is the lack of continuity of time; that is, the blocks of time available for reserve training are smaller than for active training. The result is that reserve training is characterized by a start-and-stop nature, and this makes it difficult to improve and maintain technical skills.

Isolation of Units

Another factor that constrains reserve training is that the units are geographically dispersed across the country. For example, there are 115 reserve component nondivisional maintenance units in the Army that will be required, by war plan, to support combat systems in the active component that are forward deployed and will be fighting in combat. These reserve maintenance units are usually great distances from the wartime units they will support, and sometimes great distances from training facilities

and equipment. In many cases, these units do not have combat systems to train on. They have tool sets and test equipment, but their mission is to support a particular combat system, such as the M-1 tank. How does the Army take a unit in North Dakota, which isn't within 1000 miles of an M-1 tank, and train it on an M-1 tank on a recurring basis?

The isolation of locations also means that the number of individuals at one location tends to be small, and therefore the skill expertise that is available at any one location is lower than in the active components; this causes training problems because often there are few—or no—people at the master skill level to help train apprentices. An additional difficulty in the reserve components is that people cannot be transferred from one location to another for promotion opportunities or skill enhancement.

Illustration of Differences

To illustrate the differences between the reserve and active components in terms of training, one special skill position in the Army—light wheel vehicle mechanic—can be considered. In the active component, there are 60 locations that have apprentice light wheel vehicle mechanics, and on average 100 apprentices are at each location. In the Army Guard, there are 737 locations with an average density of 11. In the Reserves, there are 515 locations with an average density of 8. Where there are few locations and a relatively large number of personnel to be trained in the same skill, training is fully efficient. Training efficiency is lowered as the number of personnel at each location is lowered. And these are not individuals who will have post-mobilization time for training in their required skill; many of them will be shipped out in the first 30 days of a mobilization scenario to the theater.

At the master skill level for this same light wheel vehicle mechanic position, the problem is even worse. Whereas there are masters at 65 locations with an average density of 20 in the actives, there are 487 positions in the Guard with an average density of 2, and 333 locations in the Reserves with an average density of 2. Some locations that have apprentices don't even have a master mechanic, and yet the masters are supposed to train the apprentices. It's a much more complicated problem in the Guard and the Reserves than in the active component.

PROBLEMS WITH REPLICATING THE ACTIVE TRAINING STRATEGY

LMI examined the apparent training strategies of a number of logistics specialties in all services, both active and reserve. For example, in the Army, the training strategy for how personnel move from the junior apprentice level (E1-E3) to senior apprentice (E4) to journeyman (E5) and finally to master level (E6) is indicated in Table 2.

The table suggests that the training strategy developed for the active component to meet active component needs has been applied to the reserve component. In essence, there is no fundamental difference between these two strategies. When reserve components must be depended on to be deployable immediately and with high-tech skills directly into the theater, the basic training strategy must undergo rethinking.

A major problem in a reserve training strategy that replicates the active training strategy is the length of the formal schools reserve personnel must attend. For example, to be a master machinist in the Army, an individual must attend an 18-week school. That may be reasonable for active personnel, but how can a reservist in midcareer attend an 18-week school? Since only a small percentage of masters come from the active into the reserves, the reserves must train apprentices and journeymen into masters.

When LMI looked at four master training courses in the Army to determine how they were serving the reserve component, it discovered that only a small percentage of reservists who were scheduled to attend those courses did attend. For example, in FY83 there were 479 training seats available for active personnel, and 344 participants

Table 2

TRAINING STRATEGIES: ARMY ACTIVE VERSUS RESERVE

	Active	Guard/Reserve
Jr. Apprentice	Advanced individual* training	Advanced individual training
Sr. Apprentice	OJT and OJE**	OJT and OJE
Journeyman	OJT and OJE plus school***	OJT and OJE plus school
Master	OJT and OJE plus school	OJT and OJE plus school

*Advanced individual training is entry-level training for primary skill qualification; not all tasks are taught in this initial training.

**OJT = on-the-job training; OJE = on-the-job experience.

***For some specialties, the individual attends a formal training course in the Army training establishment to gain additional skill.

attended; of the 58 seats scheduled for reservists, only 8 participants attended. A strategy that depends on long-term, off-site schooling is not the kind of strategy that can be used to train the Guard and Reserves.

CONCLUSIONS

The reserve component training strategies are essentially modifications of active component strategies and are based on active component needs. These strategies do not meet Guard and Reserve needs: the severe restrictions in the reserve components' time and geographical location suggest that a different training strategy should be employed. The greatest challenge in terms of reserve training is in the Army, because in technical skills the Army has made major force shifts toward the reserve component. These forces, which have a high nonprior-service population, will be deployed quickly and will not have a chance to train after mobilization.

In the future, if and when force units are placed into the reserve component, there will be difficult issues of time and geography that should be considered when developing a training strategy. Training environment differences are crucial to developing a strategy for the reserve component.

RECOMMENDATIONS

A number of principles should guide the development of new training strategies for the reserves:

- Personnel policies should be adjusted to reduce the training burden. The billet structure must not inhibit training investment; people should not have to leave the unit in order to be promoted.
- Training approaches should be designed for the reserve component environment. For example, the initial entry training for Guard and Reserve recruits must be lengthened and must take individuals to the journeyman skill level. More regional training centers should be built (the Army is implementing this idea) as a way of providing reservists with hands-on access to equipment. Also, greater use of private sector training—local technical schools and contract training—should be made. And weekend training should concentrate on skill sustainment.

- Proficiency must be measured regularly.
- Guard and Reserve units must be an explicit part of the training development process.
- Training devices and simulators must be designed for reserve component units and regional training centers.
- In hard-to-train skills, DoD should simply say that full-time reserve personnel (perhaps stationed at the regional training centers) are needed to maintain the required skill level.

Reserve training is the crucial issue associated with making transfers from the active to the reserve component. For the first time in U.S. history, reserve forces are being required to be in the forward echelons of an expeditionary combat force. That is a difficult requirement to achieve, and it will require adjustments and resource implications.

DISCUSSION

All of the examples in the presentation concerning training strategy for reservists came from the Army reserve component, and therefore the question arose as to whether the Army is representative of the other Services. Although illustrations during the presentation were taken mainly from the Army, LMI did analyses on all the Services, and there were statistical differences among them. The Air Force, for instance, has a higher percentage of prior-service personnel who have already had their formal training, and there are field training detachments that conduct technical training; also, many of the Air Guard reservists are full-time technicians, which allows them to receive daily training. Roughly 25 percent of the Air Guard/Air Force Reserve is full-time support, compared to 8 percent of the Army Reserve. Also, it was stated that the Air Force is much more rigorous about skill qualification for job assignment and promotion.

Another question addressed the reasons for there being few or no master mechanics at certain Army reserve component unit locations. The main reason given is the grade authorization in the Army force units. For example, a heavy equipment maintenance company is authorized only to E-5 for a fire control computer repairman; a master mechanic is E-6 or above.

Another issue raised about reserve training was cost. It was noted that missions are being shifted to the reserve components largely to save money, but there is also a cost in training those units so they are capable of meeting their mission requirements. Front loading of training is an issue being addressed by the Army reserve component, but there are fiscal constraints to doing that. An estimated cost was quoted of \$400-500 million more than is in the current budget.

Another view was that to make the total force work, the reserves must be capable. Affordability is not the way to think about it. It costs money to make the reserves effective.

It was further noted that even with budget constraints, the Army has been able to implement regional maintenance training facilities. It was felt, however, that instead of each center trying to train 20 to 40 skills, they should gradually become more specialized. A related observation was that the vocations of reserve units as they exist now cannot be assumed to remain the same over time, and that eventually a strategy should be developed to make regional training centers become more specialized and

better matched to the civilian jobs in those areas. Currently, the centers propagate the inefficiencies of the system in terms of geographical diversity.

XIV. IDA DEFENSE PLANNING MODEL

Phil Gould, Institute for Defense Analyses

The Defense Planning Model developed by the Institute for Defense Analyses is a set of tools used to conduct integrated cost and effectiveness analyses. The model, using aggregate data, helps defense force planners respond to questions on alternative force levels, alternative capability requirements, and alternative budgets. Designed for tradeoff analyses of force mixes, it addresses all of the force elements: active, reserve, general purpose, lift, and strategic nuclear.

BACKGROUND

IDA was asked in 1984 to assist the Joint Staff in building tools to address its new budgetary responsibilities under the Goldwater-Nichols Act. The model IDA proposed is still under development—not all databases have been completed—but IDA has begun utilizing the model's capabilities on a variety of projects, including studies on sustainability, naval options, force posture options, naval campaign model development, and arms control.

KEY FEATURES OF THE DEFENSE PLANNING MODEL

The Defense Planning Model (IDAPLAN) has three components: a cost module, an effectiveness module, and an integration module (see Fig. 12). The cost module provides summary evaluations of how changes in force posture affect cost. The effectiveness module provides summary evaluations of how capable alternative U.S. force postures are in the context of the perceived threats to the United States and its allies. The integration module links the other two modules and allows a user to analyze the impact of changes in forces, budgets, or effectiveness.

To accomplish its objective, the integration model has three modes of analysis: forces-driven analysis, effectiveness-driven analysis, and budget-driven analysis. The forces-driven analysis allows a user to specify a force posture, and then the model estimates the cost of the forces (using the cost module) and the effectiveness of the forces (using the effectiveness module). The effectiveness-driven analysis mode allows

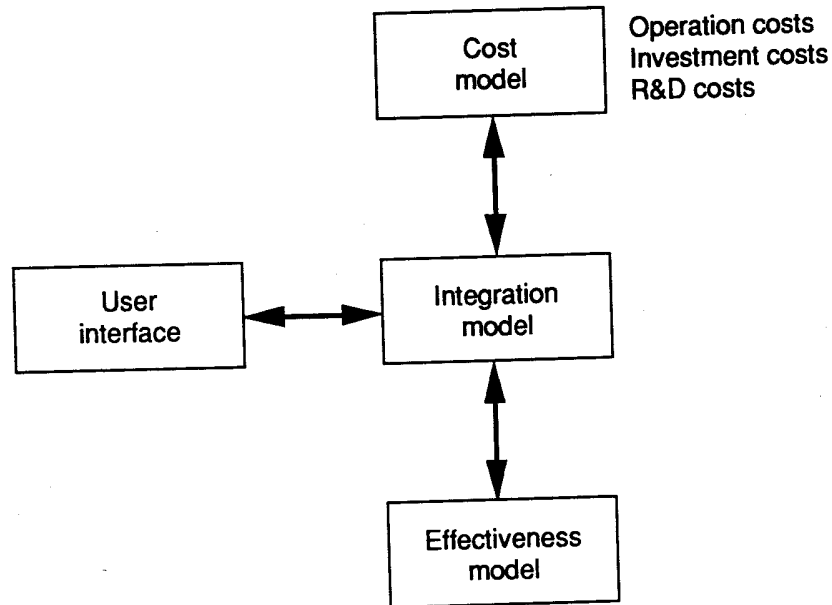


Fig. 12—IDA defense planning model

a user to specify a particular effectiveness goal, and then the model calculates the force posture needed to accomplish that goal and estimates the cost of that force. The budget-driven analysis mode lets the user set a specified budget, and then the model calculates a force posture that can be procured with that budget and estimates the effectiveness of that force.

Another way of stating IDAPLAN's capabilities is to pose the tasks as questions:

- For a given *force* level, what budgets are required, and what effectiveness is achievable?
- Given *effectiveness*, what forces are required, and what budgets are required?
- Given a certain *budget*, what forces are achievable, and what effectiveness is achievable?

Only the first question is addressed in this presentation.

In the direct mode, a user interfaces with the cost model and the effectiveness model. The kinds of effectiveness measures that are generated include intertheater mobility, naval combat, air-ground combat, and static and dynamic strategic forces. The

database for the theater land model is complete, and the one on the naval side should be completed soon. The strategic exchange model exists, but no databases have been built for it yet.

FEATURES OF THE COST MODEL

The cost model is based on the FYDP, and all the baseline costs and force levels that are in the model come directly from the FYDP. For all the cost categories included, there are individual tables, and those output tables retain the revised FYDP format. The user can change force elements year by year in the integration model, pass the data on to the cost model, and then calculate changes in costs, either TOA or outlays in constant dollars or inflated dollars. Costs are calculated individually for each Service.

Marginal costs are calculated for the major budget categories: investment, operations and support, and development.

Investment Cost Methodology. Investment costs are broken down into major procurements (such as aircraft, ships, tanks), minor procurements (such as supplies), and other investments (such as construction). Costs for major procurement items are derived from Service data contained in the procurement annex to the FYDP. Regression analyses are used to derive a cost-quantity relationship that fits the variation in the unit costs for each system for each of the FYDP years. In other words, unit costs are based on learning curves. When the user makes changes in the force, unit equipment costs are adjusted to reflect the learning curves. The learning curves are used to adjust the requirement in proportion to changes in a procurement plan.

Minor procurements and other investments are based on relationships to the major procurements, using historical averages.

Operations and Support Cost Methodology. The AMORD (Advanced Mission-Oriented Resource Displays) program, which was developed by OSD (PA&E), was used to gather the O&S costs. Using the data in the FYDP, IDA then used weighting factors to calculate what the changes in costs—both direct and indirect O&S costs—would be in each of the mission categories (O&M, military personnel, and other operations).

Development Methodology. Development cost changes are not directly related to the force changes. They are calculated as a function of the other changes made to the budget, again using regression analysis to gain some historical data.

LIMITATIONS AND STRENGTHS

As it exists today, the model has several limitations. The first limitation is that basically it's an aggregated model; it doesn't provide the detail required for programmatic decisionmaking. A second limitation is that it is not complete. On the effectiveness side, the naval database is still incomplete, and at present there is no strategic data base. The land-air model, however, is operating. A final limitation is that the cost model is based on FYDP; this is considered a limitation because the data are dependent on Service estimates.

On the other hand, being FYDP-based is also one of the cost model's strengths: the data are widely recognized, and people are familiar with the data's limitations and strengths. The primary strength of the model is that it provides an integrated treatment of both the costs and the effectiveness of large-scale changes. Another strong point is that the effectiveness model includes global scenarios, from mobilization, port facilities, and combat theaters.

The fact that the model integrates cost and effectiveness might provide a different perspective on the issue of tradeoffs between active and reserve forces.

DISCUSSION

At this point, there is no detailed treatment of reserves versus active in the IDAPLAN. A major question about the model, therefore, was whether there are plans for this, and how the model currently considers reserves.

In a certain sense, the model is quite capable of handling many of the issues addressed in the colloquium. The issue comes down to getting data that distinguish between the reserve and the active forces. IDA in fact has been working for several years to develop a plan for making tools that can better address the reserve issue. In terms of combat forces in the reserve components, the model does a good job. It looks at the forces in CONUS, takes the Army database about when these forces will be available for movement, brings them to ports, looks at availability of shipping, moves them across to Europe, and moves them from the rear of the theater to the front of the theater.

In several places the model has constructs that can be used to capture other kinds of reserve units and capabilities. It considers, for example, transportation capability within the theater, but there is not adequate data to support the analysis. It even has knobs that can be turned to vary the level of training readiness and ask: How capable are these units, or what is the effectiveness of their weapons relative to that of active units? The problem is that no one knows where to set those knobs.

Another question concerned whether the model identifies bottlenecks. For example, if a maintenance unit can't be moved to the front in a reasonable amount of time, and all the equipment breaks down, does the model consider this? The answer is that the output from the model is aggregate and gross. The model estimates the transportation as a whole through the front, and it does consider availability of spare parts, POL, and repair capability, but it lacks detail. In this sense, it's quite crude.

Other questions addressed whether the model can be used as a tool to look at force structure modification. The response was that when there's much uncertainty, IDA has tried to bound—lower and upper bounds—savings and capability rather than estimate.

Data issues also surfaced, since there aren't data on increasing the dependence on reserve components.

A series of questions addressed cost. For example, how might the model be used if someone wanted to look at deactivating a division in Europe and relocating it in the United States, or alternatively disestablishing the division and setting it up as Guard or

Reserve units? That is, how does the model price out those kinds of decisions? What are the kinds of things it would look at?

The answer was that the model would look at operating and support (O&S) costs. It would compare the O&S costs for a unit in Europe to those for a unit in CONUS. On the procurement side, it would consider options for basing—e.g., whether new bases must be procured. The development side would likely be neutral. The model could then give a range of estimates of the savings (or costs) of converting those active units into Guard or Reserve units. It will give ranges of what the changes in the various accounts will be between having a unit in Europe and having it in the Guard. There will, however, be considerable uncertainty associated with that.

The first-order estimates of the model will be the difference between the average unit support cost in Europe and the average unit support cost in the reserve. To get more detail, the user would have to specify where the reserve unit is to be located and other details. The model, however, deals only in average expenditures.

XV. RAND'S RESEARCH ON ESTIMATING THE COSTS OF TOTAL FORCE MIX DECISIONS

Glenn A. Gotz, RAND

This briefing provides an overview of current and recently completed RAND research projects on cost and methodology issues, the focus being on the costing of policy or resource allocation decisions. Most of the presentation focuses on RAND's efforts to develop a systematic approach for estimating the cost of such activities as changes in the active/reserve mix or in the personnel force structure—i.e., incremental costs and costs of changes.

THE ENVIRONMENT FOR COSTING IN THE PPBS

Often, what a cost analyst is asked to do is estimate how much money will be saved or how much it will cost to transfer a particular unit from the active to the reserve forces. That is a difficult task because of the environment for costing in the PPBS. First, proposed changes are not always well defined. Second, cost factors are often missing or not documented. The Army and the Navy, for example, haven't had new cost and planning factor handbooks in a number of years, and therefore there is a lack of commonly agreed upon cost factors. Third, cost methodologies are varied and often inconsistent. For example, in some cases when an analyst wants to figure out the budget, he wants to average fixed costs over appropriation categories; he may want to take fixed costs and average them along with variable costs to make sure he is picking up all the costs in the budget. On the other hand, if the analyst is asking about a particular policy decision and wants to know how DoD's costs will change with this decision, then costs that won't be affected by the policy decision can be ignored. Thinking about the different parts of the PPBS and what cost numbers are used for helps explain what appear to be inconsistent methodologies; still, the lack of uniformity means difficulty for the cost analyst.

Another difficulty with the environment is insufficient time to do thorough analysis. Compounding this problem is that case histories, which could be used as guides, are usually unavailable. Typically, one can't go back into history and find out

how someone did it before. A final difficulty is that many cost analysts are inexperienced. Many of them lack the knowledge gained through 20 years' experience in the field, and this inexperience translates into problems for a cost analyst who has to conduct a quick and accurate study for his supervisor.

RAND has been conducting a number of projects to help resolve these problems. The studies fall into the broad categories of active/reserve unit costing, DoD cost factors, and personnel costing.

A STRUCTURED APPROACH TO ACTIVE/RESERVE COSTING

In "active/reserve changes," there is hardly ever a complete *transfer* of resources from the active forces to the reserves. Typically, equipment is transferred, but the *people* in the active force are reduced in number or transferred to other active units. People are almost never transferred from the active to the reserve forces directly. The first question that should be asked is: "What is being added to the reserve forces?" A certain number of pieces of equipment are being added and a certain number of people of different categories and different occupations are needed, etc.

The next question is: "What's in the active forces that's no longer going to be there?" There are a certain number of pieces of equipment, a certain number of people, etc. Then the analyst wants to know if there is a difference between the resources that are going into that new reserve unit and the resources that are being drawn out of the active unit. Where are those resources coming from? Where are they going?

A proposed active/reserve change, therefore, can be viewed as a set of transactions: adding or subtracting units or resources within units, and balancing entries by determining the net change to DoD resources of transfer resources to/from other units.

Consider this hypothetical example: C-141s are being transferred from the active to the reserve forces, and the flying hours are reduced since reserve C-141s fly fewer hours than C-141s in an active unit. What's happening to the difference in flying hours? Is there a net reduction to DoD for total number of flying hours? Or is something else happening? If the active force has fewer C-141s, which are used partly to train C-5 copilots, how will the Service give those C-5 copilots the necessary training? Also, C-141s provide some lift, and how is that transportation going to be replaced? Will the flying hours of the remaining C-141s and C-5s increase, or will contract airlift be purchased?

Tracking the Resources

A major problem in active/reserve costing and other sorts of costing is typically inadequate tracking of resources to figure out the actual net change in resources that DoD needs. Net change in resources demanded by DoD is in fact the cost—the incremental cost of that decision, which may have multiple aspects.

RAND has developed a structured approach for asking about net change. There are basically two parts to cost analysis: one is figuring out what resources are part of the decision, and the other is putting a price tag on each resource. Many studies, especially unit-cost analyses, focus primarily on the second—pricing out resources on units.

The approach RAND has developed is a paper method that guides the analyst through a process to gather the information necessary to do his cost analysis. The analyst goes through a list of questions that are subsets of the following sources of unit cost change: wartime mission, types of skills and number of people, types and quantities of equipment, peacetime optempo, and basing.

Many questions are associated with each category. As the analyst works through the questions he will probably not be able to answer all of them. So he either has to go to a higher level and ask "What are we assuming here? What is the decision?" or he is going to have to give a range and say "I don't know what's going to happen here."

Next Step in Active/Reserve Costing: Automation

Because this paper-and-pencil exercise is laborious and time consuming, RAND is developing in prototype an automated system, which is being sponsored by OASD (PA&E) and OASD (FM&P). The work is focusing on active/reserve changes, and Phase I of the exploration has been to do a number of case studies to make sure the basic approach is not limited to a particular class of active/reserve change.

Phase II has been to generalize cost estimation concept prototypes. Execution planning and budget categories have been added, and a general computer architecture has been developed. Like most models, once the architecture is developed it can do many things, so the question is what to do once the data have been gathered.

In Phase III, Xerox will develop the demonstration prototype, and RAND will then identify additional case studies, address data requirements, and help PA&E ensure that all the different tools that need to be integrated in fact are integrated.

C-5 Case Study

PA&E provided an example of a C-5 study that illustrates the potential value of an automated system. Doing a quick study of a particular active/reserve change using the Air Force's cost factor manual, a PA&E cost analyst found that the break-even point (when the operating and support cost savings from the change balanced off the transition costs) was about three years for one of the options studied. When more time was spent obtaining actual data from the Air Force, the estimated break-even point was later. And when additional months were spent on a detailed study of maintenance manpower requirements, it was found in this particular case that there were not any significant cost savings.

It wouldn't be wise to generalize from this and say that whenever one has more time, one will find that cost savings aren't as big as initially thought, but it is commonly going to be the case that the less time one has, the more things will be missed. It is hoped that this automated system being developed for active/reserve costing will shorten analysis times significantly.

DoD COST FACTORS

The earliest of the research projects discussed in this briefing, conducted for Reserve Affairs some years ago, developed and documented case studies of reserve unit costs. A major finding was that there wasn't sufficient information available for OSD to determine the operating and support costs of those reserve units. The absence of commonly agreed upon cost factors, especially in the reserve forces, remains a big problem. Current cost and planning factors are still not available from the Army and the Navy, and even Air Force Manual 173-13 is good for only a limited set of resource analysis changes. RAND is therefore conducting a study for OASD (PA&E) that it hopes will help solve the problem of cost factors. The objective of the study is to derive standards for cost factors that will satisfy decisionmaking.

There are three phases of the study. First of all, the needs of the system must be determined. Of the huge amounts of data out there, what is needed to support PPBS and the weapons acquisition decisionmaking process? To this end, a major task describing and analyzing existing Air Force cost factors has been completed, and another study has begun to critique those cost factors. That study will identify and evaluate data sources and methods used to define, refine, and use cost factors. Similar tasks have been initiated

on Army cost factors, with the Navy to follow. The final step will be to recommend actions that should be taken to develop and improve factors and display them in a form useful to analysis organizations.

PERSONNEL COSTING

RAND is also doing some work on personnel costing, and again the interest is in changes in resources or personnel. There are two basic problems in personnel costing, the first being that many costs are improperly averaged over man-years. If it is decided, for instance, that the active force is going to be reduced by a certain percentage, sometimes training costs will not be saved. Training costs are not averaged over everybody; training costs occur primarily at the beginning of the career. Likewise, retirement costs are not averaged over everybody—only for people who actually retire. RAND developed tables of incremental costs of active military and civilian personnel that will distinguish between man-year costs (such as basic pay), and event-related costs (such as training). The tables are designed to update and improve "Average Cost of Military and Civilian Manpower in the Department of Defense," which is a comptroller document that was last published nearly ten years ago.

The second problem in personnel costing is that the feasibility of adding or subtracting personnel is not considered. When DoD is looking at a change—for example, to establish an active or reserve unit—the feasibility of that change needs to be assessed in terms of personnel, since it takes time to develop personnel. To address this issue, RAND is developing an inventory projection model for costing changes to the personnel force structure. The model will consider the transition between military personnel forces and will estimate changes in accessions, retention, and retraining required.

ADDITIONAL RESEARCH REQUIRED

Much research still needs to be done. At a minimum, work is needed on estimating cost factors for resources that don't vary in direct proportion with measured outputs. Headquarters functions and depot resources are good examples. Another example is maintenance manning, and this is a particularly difficult one because of the differing philosophies among the Services in how they maintain equipment. In the Air

Force, for instance, there is a minimum manning level in various shops, and therefore the manpower requirements don't necessarily go down in proportion to the flying-hour program or to the number of aircraft.

Another major area requiring additional research is cost factors for reserve units. There are still real limitations on good data for reserve units.

Finally, in the best of all possible worlds, there would not be a distinction between the cost factors used to develop the budget and the cost factors used for policy analyses. One should be able to walk between the two and not have inconsistencies. Clearly, some crosswalking needs to be developed so that what one thinks he is getting when he does a policy analysis is what he gets when it appears in the DoD budget.

DISCUSSION

Most of the comments made following this presentation fell into one of four categories: the nature and utility of the studies, the relationship between calculating resources freed up and deciding what to do with those resources, the effect on wartime missions of decisions, and the attribution of costs.

A major question was what value the proposed structured approach would hold for a defense secretariat-level policymaker. The value of the approach, it was argued, would be in tying a dollar number to a particular decision, and in making explicit all the assumptions about what happens to resources. That the peacetime optempo is going down, for example, would be explicit, and the policymaker could therefore make a judgement based on that knowledge. One couldn't say that the unit will be less effective, because this is just the cost, not the effectiveness. In fact, it was emphasized that this project was not a cost-effectiveness analysis.

RAND's observation in looking through numerous cost analyses was that the assumptions were usually unclear. For example, in a typical active/reserve comparative analysis, the analyst presents the O&S costs associated with an active unit and those associated with a reserve unit, then subtracts one from the other and presents the difference as savings. There are many assumptions embedded in that analysis. One assumption, for example, is that if there are any equipment differences between the two units, there's a net change in the amount of that equipment in DoD; another assumption is that if there is a difference in personnel between the units—and there always is between full-time active and mostly part-time reserve personnel—then that too is a savings to DoD.

If one does costing that way, and if one does many active/reserve transfers, enough money will eventually be saved to pay for the whole DoD budget. But DoD doesn't work that way. Often, people and resources released from active units are used elsewhere in the active force. If they are not released from the active force, there are no savings.

RAND is saying that one ought to track where the resources are going to and coming from, and whether there is really a net change in DoD resources. Once something has been tracked and an analyst has a balance sheet that says what is being added to units, what is being subtracted, and where the differences are coming from, then

the assumptions behind the analysis can be made explicit, and the true cost consequences can be derived.

Several participants contended, however, that the cost analyst should not cost out what happens outside the units under analysis. If there are still freed-up resources attributable to the transfer of a unit to the reserves, then these should be counted as a cost savings regardless of whether the resources are used elsewhere in DoD or released. They argued that the policymaker then has the additional decision of what to do with those resources. However, the RAND position is that these resources need to be identified in the balance sheet.

An example was given to clarify the RAND position: the hypothetical transfer of a squadron of C-141s from active to reserve forces. Certain things must be specified, such as the resources in the active unit, the resources in the reserve unit, the O&M expenditures, the replenishment, etc. After examining those, one can make the decision that all of these resources are freed up and costed out and say, "Here's how much money would be saved if the net resources were given up from DoD." Then one can ask, "Now that the Department has all this money, what should be done with it?" There is nothing that precludes one from asking that question in the POM process. One must always come up with an offset, and costing is needed to calculate the offset. This approach will allow a decisionmaker to figure out whether there will be an offset.

Several participants said that this is a two-step process, and the calculations should be done separately. That is, what one first wants to identify is what resources or end-strength are freed up. The second step is to decide what to do with those resources, since the options are many and varied. It was further suggested that it's easier to decide whether to make a shift from the active forces to the reserves without bringing in the additional issue of end strength. The RAND response was that it may be a two-step process. In the C-141 case, it was argued, the decisions would be intertwined: What one is going to do with the flying hours given up in order to take care of the C-5 copilots and take care of the lift was part of the original problem and should not have been ignored.

The structured approach also addresses the question of whether the wartime mission changes if a certain decision is made. If a squadron of F-16s is transferred from the active to the reserve forces, for example, the answer would probably be "yes"—part of the wartime mission would change because some activities might not be done in the reserves that would have been done in the active force. The change in mission leads to a

question about training: How does the training program change because of their having a different mission? Implicitly, there is also a question about how the unit will be composed during peacetime.

The final category of discussion was cost attribution. The question was asked whether various costs are attributed to the active forces or to the reserves and, if so, which costs. The response was that the structured approach does not attribute costs to the reserves or to the active forces. What is being estimated are the cost consequences of decisions, not the allocation of these costs among the components.

XVI. TRANSFERRING ACTIVE FORCES TO THE RESERVES

Lane Pierrot, Congressional Budget Office

The purpose of this presentation was to give a congressional and budgetary perspective on total force policy and management.

CONGRESSIONAL INTEREST

Although Congress has been interested in the force mix for a number of years, interest is especially high now because of pressure to control spending. Since budget pressures are not likely to abate in the foreseeable future, congressional concern is likely to continue. There is particular concern on Capitol Hill at this time about the small savings from the forces that were cut out of the amended Presidential budget. Another reason for the current interest in force mix is that the reserve contribution for U.S. forces is considerably smaller than for many of our NATO allies (their reserve contribution on average is about 60 percent, ours about 35–45 percent), and some members of Congress feel the United States should scale its mix more closely to that of the NATO allies.

Another issue is the impact that conventional force negotiations with the Soviets might have on the budget. If the proposed Soviet cuts in forces in Central Europe were to materialize, the United States will face a considerably reduced threat; and if we face a reduced threat, support for defense spending could well diminish. In such a more stable world, transfers to the reserves might be viewed simply as an intermediate step between keeping forces in the active component and getting rid of them completely. Options that make large changes—and save large amounts of money—may be more appealing after successful conventional force talks.

As a result of all this interest, CBO has been asked to conduct several efforts on reserve transfers this year. The first was to prepare testimony for the Senate Armed Services Committee on potential transfers in the Air Force. There is also a current effort for the Senate Budget Committee that is looking at DoD-wide transfers.

BROAD ISSUES IN CONSTRUCTING TRANSFERS

While conducting these two efforts, CBO has become aware of several important issues pertaining to force transfers: the size of transfer, allocation to the Services, and force choices.

How Big a Shift?

How big a shift is feasible or reasonable? The answer, to some extent, depends on where one is sitting. The Services tend to view even relatively small transfers as being unacceptable. They typically feel that the current active/reserve force mix is approximately right. For example, CBO testified before the Senate Armed Services Committee that one option CBO had constructed for the Air Force was to transfer about 145 planes out of the active forces into the reserves. That would have resulted in a shift of about 4000 personnel—less than 1 percent of the total Air Force—but this was considered unacceptable by the Air Force. Such a shift—145 planes—would save about \$200 million. These savings are quite small in relation to the amount that some people on the Hill are talking about taking out of the defense budget.

How Should Transfers Be Allocated Among the Services?

What is the appropriate mix for each Service? Should the Army, which already has roughly 50 percent of its force in the reserve component, be exempted from further transfers from the active component? Should the Navy be exempt because it has a high peacetime operating tempo? If one is looking for big savings, options may have to encompass all the Services—with no exemptions.

Which Forces Should be Transferred?

The Administration's position has historically been that shifts to reserves should be made in areas where capability will be reduced only marginally. Potential targets for transfer might be areas where reserves have been shown to perform well, as in the air units, or forces that would be needed only for major mobilizations. When looking for big savings, the ground forces may be particularly lucrative targets. In comparison to the \$200 million estimated to be derived in annual operating savings from the transfer of 145 planes, transferring an Army division would potentially save several billion dollars.

ESTIMATING SAVINGS

The savings that accrue from shifting active units into the reserves depend to a large extent on the assumptions used in the analysis. Assumptions about operating and support costs, procurement, and construction affect the amount of savings anticipated from transfers.

Operating and Support Costs

Two models are particularly useful in estimating O&S costs for DoD: the force acquisition cost model, discussed in Phil Gould's presentation (see Sec. XIV), and the Defense Resources Model, which CBO runs. Some caution is warranted in interpreting their results—because they are budget based and because of the way the program element structure is put together—but they are the only models CBO has found that provide estimates for all active and reserve components.

The O&S assumptions one makes can decrease or even eliminate savings. For example, assuming that DoD will keep active end-strength constant greatly affects savings. Another issue is whether the operating tempo should be increased in reserve forces in order to replicate the tempo of the active forces. An example of an assumption that would *increase* savings is cutting support requirements. In options that make large changes to the force structure, it may be reasonable to assume that some of the support can either be transferred or cut. This assumption is particularly critical if one is considering big active end-strength reductions for the Navy or the Air Force.

Procurement

Buying additional lift is a common assumption DoD makes when analyzing the impact of moving forward-deployed forces into stateside reserve units. The costs associated with this assumption can easily swamp operating savings. Not buying lift and therefore accepting somewhat longer delays in mobilization avoids these costs. A way to increase savings is to slow modernization in the reserve components. Such an assumption might be justified by the fact that the U.S. currently tolerates somewhat slower modernization in the reserves.

Military Construction

Ways of saving money on military construction through shifts to the reserves are difficult to find. There may, however, be large construction *costs* associated with transfers. For example, if large force changes are made in the Army and the reserve units are placed in decentralized locations, then bases must be built, and that could mean fairly substantial military construction expenditures.

CAPABILITY

Many people on the Hill and some in the Administration believe significant amounts of money can be saved by transfers without affecting capability. That may not be a reasonable view. But if one is willing to accept marginal or somewhat larger decreases in capability, then some money can definitely be saved. And if there are declines in the capability of the threat, policymakers may be willing to accept some degradation in U.S. capability.

It is highly likely that DoD will in the coming years be facing major reductions in funding. If DoD attempts to reduce costs by accepting a force structure with a larger reserve composition, it may also need to abandon the attempt to make reserve units as capable as active units. The assumptions described earlier that produce larger savings—including slower modernization and mobilization and lower operating tempos—also yield less capability.

CBO currently has no way of quantifying the implications of reserve transfers for all of the Services. Indeed, many efforts to build DoD-wide capability models have been unsuccessful. Nevertheless, ascertaining changes to capability caused by transfers must be attempted.

Readiness. The loss in readiness from transfers must be characterized empirically. If DoD, in order to save money, decides not to increase the operating tempo, for example, it should be able to measure the impact on readiness. At present, there is no way to quantify that. What is needed is a method of estimating new readiness levels in relation to budget cuts. Unless such a methodology is developed, people will continue to think that capability is unaffected when dollars are cut from operating accounts.

Mobility. It may be easier to estimate the effects of transfers on mobility than on readiness, at least in terms of slowed mobilization due to forward-deployed forces being

shifted to the reserve components. If a heavy Army division is taken out of Europe, when can it get back if additional lift has not been bought? Most people don't factor lift into options for active-to-reserve transfers because doing so cuts deeply into the operating and support savings.

Systems Capability. A method is needed to tell what happens to capability if modernization is slowed. While methods exist that provide rough measures for the Army and the Air Force, CBO is unaware of any similar methodology for the Navy and Marine Corps. But if savings are produced by slowing modernization, it would be useful to measure what is lost in systems capability.

POTENTIAL SHOW STOPPERS: OPERATIONAL CONSIDERATIONS

Usually, assumptions concerning operational details do not have a substantial impact on policy decisions, but in the case of force transfers, seemingly minor considerations can turn out to have a major effect on the expected amount of savings and the level of capability. One operational consideration, for instance, is timing. If savings cannot be derived within a year or two, the interest of Congress and the Administration often wanes. There is pressure to assume that transfers occur very rapidly and that savings also come rapidly. That may be a reasonable assumption for small transfers, but for larger transfers it may be less reasonable. Another problem with funding is that there are often increases in investment up front, while operating savings occur in the out years.

A second operational consideration that can greatly affect transfers is availability of basing. If there is a large shift in Army units, for instance, bases may need to be constructed, and that will affect timing. This is an operational detail that is relevant in terms of the feasibility of the option.

A final operational consideration when determining whether transfers are feasible is manpower. Can large, additional numbers of reservists be recruited? There are indications that the Army Reserve is already having difficulty meeting its manpower requirements. If it is having difficulty now, is it feasible to shift more units into the reserves? There are ways, of course, to address this problem, including, for example, new funding schemes that would give bonuses, but significant feasibility issues persist.

SUMMARY

There are three major conclusions about transfers. First, they will be of continuing interest. Second, the need for savings will dictate some loss of capability. And finally, transfers are complicated to analyze because they touch on all Services, most missions, operating and support issues, procurement issues, and perhaps even development issues.

DISCUSSION

The consensus seemed to be that despite the lack of good measurements on savings and capability, and despite unresolved issues such as basing, manpower, and modernization, the possibility of transfers will continue to be discussed. The impetus is coming from Congress, and CBO has been trying to respond to Congress's need for options.

One topic of discussion addressed CBO's approach for presenting possible transfers to Congress. CBO's approach will be to initially structure some of the alternatives for transferring forces. It will likely offer illustrations that span a range of transfer possibilities, from small to quite large. This will not simply be an option such as "cut 10 percent of the end strength," but rather will consider the transfer of certain numbers of types of units. CBO will specify options for which types of units would have to be transferred in order to achieve designated percentage goals. CBO will identify the units to be transferred in its estimates and will try as best it can to estimate the consequences in terms of capability. These will be illustrations only; they will not be CBO recommendations to actually move those units into the reserves. The intent will be simply to inform Congress of the kinds of results they should expect to ensue from a transfer of a certain magnitude.

One view expressed was that DoD should be making those sorts of options and measurements itself. The Services and OSD should be performing those sorts of drills every year.

The DoD view might be expressed as follows. Militarily, it does not want to reduce capability, but it recognizes that when a transfer is made, there is going to be some restructuring of its mission tasking statement. But short of something major like a conventional forces agreement where there are asymmetrical reductions in the amount of threat foreseen, DoD thinks it is unwise to look at a wholesale transfer into the reserves just to meet fiscal goals.

XVII. LINKING NATIONAL SECURITY OBJECTIVES AND TOTAL FORCE MANAGEMENT

**David Chu, Assistant Secretary of Defense,
Program Analysis and Evaluation**

It is appropriate that the participants of this conference are focusing on force analysis questions, because DoD faces several significant, intertwined challenges in the near future that will directly affect total force management:

- First, we are entering an era of more limited defense budgets: defense budgets may decline, in real terms, over the next few years.
- Second, forces in Central Europe may be reduced significantly.
- Third, the Soviet Union is widely perceived as a much less threatening actor on the world scene. Since the Soviet Union has been the main motivating force for our maintaining large active military forces for the better part of five decades, this perception is likely to affect total force management.

It may be that, given these factors, there is no "natural" floor for the defense budget. We have seen for the first time a major commentator, former Secretary of Defense McNamara, say in a San Diego speech that in his judgment it is time to cut the defense budget from the current 5 to 6 percent of gross national product to 3 percent, the figure that characterizes most Western European nations. Should such an event occur, the redirection that would be required would make the current debate over cancellations and force-structure reductions pale by comparison.

VIEWING TOTAL FORCE AS A CONTINUUM

This, then, is an era of potentially enormous change, and it is a time for the analytic community to take a zero-based look at all issues. It is not appropriate to accept, in a sterile fashion, any situation as a "requirement." Everything is potentially variable in the kind of future we may confront, and there are no particular assumptions that ought to be seen as sacrosanct. This includes some of the classifications used in the defense

manpower community itself. Too frequently, we have resorted to rigid, compartmentalized classifications in attempting to categorize personnel. It is common, for instance, to say that there are active forces and there are reserve forces, and that there are military forces and then there are civilians. The view that arguably should be taken is that there is actually a continuum of forces, and we should compel ourselves to look at manpower issues in this way, rather than viewing force elements as existing in discrete "compartments" that are sharply differentiated from one another.

In practice there is already more continuity than the "active versus reserve" and "military versus civilian" classifications would imply. The private contractors who help maintain some of our major weapon systems occupy a position somewhere near the middle of the force continuum. At one time, we had civilian technicians working aboard carriers deployed with the fleet. In Vietnam, the Army actually used contractors to move ammunition to forward depots and to run convoys. Where is the dividing line between military and civilian in these instances? Yet within DoD, various voices say we cannot give certain activities to civilians because they might not be there when "the balloon goes up." This is a specious argument. We already have individuals with quasi-civilian/quasi-military status: the Army has civilian technicians, and the Air Force has a similar program.

Nor can we view reserves as serving only one function or being only of one kind. There are some reservists who spend very little time actually contributing to the current output of DoD and other reservists who fly actual missions. The Army has tried out a few innovative ideas in which reservists are used in traditionally active roles. For example, reserve units are being sent to Europe to help relieve the backlog there in helicopter maintenance. We need to avoid thinking of defense as something divided between two groups of people, one that does two weeks of work a year that is largely perfunctory and symbolic in nature, and another group of combat people that is on duty all the time. The gradations in between ought to be thought about, ought to be debated, and ought to be agreed on as a basis for analysis.

Removing some of these barriers and looking at the forces more as a continuum is important because it helps us see what classes of personnel might contribute to the output of DoD. If indeed we are facing a substantial reduction in the resources that the country is willing to apply to defense over the next five to ten years, then we are going to need new solutions. For example, even if we reach some bright new world in which the Soviet

Union is less adversarial, there will be a difficult transition period in which, in order to secure the negotiation outcomes the United States seeks, we will have to maintain clearly capable forces, even though the country may be reluctant to pay for them. How do we do that?

SEEKING SOLUTIONS TO IMPENDING PROBLEMS

One answer we might explore in more depth is to move to a higher proportion of cadre units, which is something the Soviets do. That is, we might try to retain primarily our highly skilled, extensively trained, experienced personnel.

This solution seems more logical than another strategy being discussed, which is to cut back and then, when necessary, apply intensive training. It is doubtful that, in the event of a contingency, we could simply "turn up" the training dial and run the force at higher rates for a few months and have a well-trained and competent force. We cannot get a battalion commander overnight, and a ship captain cannot become competent and confident in the use of his vessel overnight. That takes years of training and experience.

The way to store capability in a transition period might be, therefore, to retain a large number of highly experienced people, even though the size of the force might be small. Obviously, this will not work forever because of the difficulty of regenerating a cadre of experienced personnel within a small active force. The cadre solution is not a particularly popular idea in many quarters of the military, and it might be viewed skeptically by people outside DoD who would argue that it favors retaining commissioned and senior noncommissioned officers at the expense of junior enlisted personnel. Nevertheless, it is a topic worthy of research.

Another issue needing resolution is how we deal in our force structure with the possibility that the Soviets might not, in the end, become less aggressive. There is room for skepticism about what the Soviet Union will look like ten to fifteen years from now. If the Soviets do not become less confrontational, the United States would need to resurrect a large standing military force—and not take ten years to do it. How does one do that?

Finally, there is going to be considerable concern, and indeed there already is concern, about situations *not* involving the Soviet Union. How does the United States plan to be ready to deal with those situations? This is one of the places in which a certain tension has existed in the way various actors have understood the phrase "total force

policy," which places a significant reliance on reserves. In DoD we are likely to see some swing of the pendulum back from what might be argued is an extreme position, with extraordinary reliance on the reserves even for "small" contingencies.

It is not clear, however, what force level ought to be available to the president so that, to deal with a contingency, he does not have to use active forces dedicated to the defense of the Central Region of Europe, or order significant reserve mobilization, in the sense of calling individuals out from civilian occupations. Many are concerned that to provide such a contingency force would take more support elements in some kind of active or quasi-active status than are currently being maintained. If an ability to deal with contingencies outside the Central Region is required, then the United States may need support units, available on short notice, whose use does not create a major political problem at home.

To sum up, the kinds of subjects being discussed at this conference are the subjects we should be working on. The very notion that the agenda is focusing on forces is commendable. In relative terms, this is the area where the most analytic work needs to be done. I applaud you for undertaking it, and look forward to the results.

XVIII. SUMMARIES OF GROUP DISCUSSIONS

After a day and a half of presentations and related discussions, the colloquium broke into groups to explore three issues: the link between defense strategy and decisions on total force composition, research needed to assist implementation of total force policy, and capability assessment tools. Each group, which was composed of representatives from diverse organizations, discussed and debated for more than an hour, and then the groups reconvened and reported on their respective topics to the whole colloquium.

LINKING DEFENSE STRATEGY TO TOTAL FORCE COMPOSITION DECISIONS

Donald Srull, Group Leader

The group agreed that a theoretical construct exists within DoD to relate strategy to decisions but felt that the system currently does not adequately respond to the demands placed on it. At present, the system is geared toward looking at incremental changes, not larger changes.

A major question discussed in the group was whether the Services can relate strategy to decisions, or whether the responsibility should be centralized—i.e., within OSD. A related observation was that clearly defining responsibilities would make the decisionmaking process easier.

Another question was: Should the defense community look at threat first, then determine strategy, and then look at constraints? Or, in the current budgetary environment, should it look first at the realistic constraints and formulate strategy according to that?

On the issue of what further research would be most profitable in this area, the group agreed that a number of research areas need continued attention, including better costing and better definition of alternative forces.

RESEARCH TO ASSIST IMPLEMENTATION OF TOTAL FORCE POLICY

Karen Alderman, Group Leader

The group divided the issue into three parts and articulated a number of observations about each:

Specification of Capability Objectives. Capability objectives must be specified in terms of both priority and probability of execution. Although there is a policy that defines threat in global terms, none specifies capabilities in concrete terms. The first step, therefore, is acceptance of a policy that specifies capability; the second step is to conduct research on what to do with those capabilities.

Costing Methodology. There hasn't been in operation a standard costing methodology in DoD, and therefore a policy is needed that sets costing methodology as a priority and accepts a standard costing methodology as an objective. If one accepts the policy, it must then be executed effectively.

Reserves. This is the issue that received the most attention by the group, which divided the discussion into five subissues needing further research: active/reserve structure principles, mission stability, structure of reserve units, sunk costs, and training.

- *Active/reserve structure principles.* Successful units need to be studied to determine what attributes they demonstrate and whether those attributes can be exported to other units.
- *Mission stability.* Mission stability has to do with capability and how readiness is evaluated. Currently, there is not a policy to keep missions stable, and, in the Army especially, many ratings reflect turbulent mission assignments. The issue, then, is the impact of changing policies with respect to assigning and reassigning mission and reserve units. What is the impact of changing policy?
- *Structure of reserve units.* Reserve units currently mirror the structure of active units, the assumption being that the war planners need interchangeable units. Is the assumption valid? Should reserve units be designed differently from active units? The consensus of the group was that the assumption is not valid and therefore should be reconsidered. DoD may be losing an increment of capability by adopting a mirror design; instead, it could design reserve units differently to optimize more senior capability. The group also felt that

the flow from the active to the reserve components could be optimized in order to save money and have a more capable force.

- *Sunk costs.* What types of research should the defense community be exploring about sunk costs? There was general agreement that exploiting shared indirect costs and sunk costs was one way of getting more capability. An example was the Air Force associate program, where reserve units are co-located and co-assigned with active squadrons, and all the indirect costs associated with the active force are shared by the reserve force.
- *Training.* Training policy, which was viewed as being ripe for in-depth review, should be a priority area for research. The basic research questions are: What essential training is needed, and how can it be done better? Should reserve training mirror active training? On the active side, the question is whether active forces are trained for wartime missions by what they do during peacetime.

CAPABILITY ASSESSMENT TOOLS: WHAT NEEDS TO BE DONE?

Craig Moore, Group Leader

This working group began by outlining the reasons for needing capability assessment, set the context in which capability assessment is conducted, reviewed existing models for assessing capability, and ended by enumerating a range of research questions needing further analysis.

Purpose of Assessment. The consensus of the group was that there is a wide array of reasons for wanting to do capability assessment, and there are legitimate needs for capability assessment at all levels: unit resource enhancement (equipment, supplies, people, and training), war/contingency planning, resource allocation (within Services and across Services), and national decisionmaking (defense budgets and national security strategies). The feeling of the group was that the lower levels seem to be the driving element in capability assessment. Also, the defense community seems more satisfied with what exists at lower levels in terms of capability assessment. The higher one goes in the hierarchy, the higher the level of frustration becomes, for example within Services, across Services, and at the congressional level.

Context of Assessment. There must be a context for doing capability assessment, and the group focused on the contingencies for which the United States is

trying to prepare. What kind(s) of contingencies should DoD plan for? What are the operational objectives? There are various characteristics that might distinguish contingencies, including size, location, mission mix, warning time, employment timing, and so on.

Existing Tools for Assessing Capability. The questions to be addressed in this issue are: What tools already exist relating to individuals? to units? to forces? Numerous tools have been developed by the Services, by OSD, and by FFRDCs, but the analytic community isn't sufficiently aware of them. The group suggested that a catalog is needed of the tools available at various levels. A few documents exist, such as a National Reserve Force Policy document, and there are a number of performance assessment systems in the field—for example, FORSCOM has a Force Assessment Model. The analytic community needs to not only identify those systems, but also have access to their data. Analysts are interested in several characteristics of those tools, such as data and computational requirements, objectivity, cost, and speed.

Research Questions. The bottom line is which research issues in capability assessment should have top priority. The group generated six basic questions needing further study:

- What are the capability/performance objectives at these different levels: For individuals? units? forces? There are objectives stated for each of these levels, but they are delineated, and the connections between the levels are not well understood.
- How do resource levels (pre- and post-mobilization) affect the length of time it will take to get units up to their required capability? How does one estimate the wait?
- What is the effect of DoD having to put together forces of different capabilities? For example, what is the effect on force capability of having a force consisting of units having different levels of readiness?
- How do combat units' capabilities depend on the capability and timely availability of supporting units and reserves? How would capability be diminished with diminished resources?
- How does one represent capability concisely? How can current capability be compared to past capability, and how can it be projected to the future?

- Finally, how does DoD convince Congress that DoD's assessments represent expertise and not simply subjective judgment?

XIX. SUMMATION

The colloquium explored a number of important subjects and succeeded in reaching its major objective of developing research issues needing further study. The major themes discussed and elements of a research agenda are summarized below.

A major theme that came out of the discussion was the importance of being able to relate training policies and resources to the ability of units to perform their wartime tasks. If we can do that, then appropriate policies and appropriate resource levels can be selected.

The defense community is certainly at the stage where it can identify training problems, and some very good ideas have been offered for solving them, such as regional training centers. Other solutions are needed, as are means of evaluating whether the proposed solutions will solve the problems. Some problems are quite costly to solve, and therefore rather than adopting a training strategy that may not be totally feasible or effective and trying it out nationwide to see if it works, field experiments might be more judicious. Different training strategies might be tried out in different types of field experiments.

Considerable experimentation has been done in other areas, including a training experiment RAND conducted at Fort Gordon in which interactive video disk technology was tried out on two different communication specialties. RAND has also done experiments on nationwide recruiting, the Army College Fund was a test cell in the Education Assistance Test Program, and increasing enlistment bonuses has also been tested in a field experiment. Perhaps when the effectiveness of a proposed training policy is uncertain, analysts should think about partitioning the country or partitioning units into different groups and then trying out the proposed changes on a one-year or two-year basis.

Another major theme that emerged from the colloquium discussions is the question of what effectiveness measures should be used when conducting active/reserve/civilian force mix analysis. There are two questions embedded in this issue, one long term and one short term. The long-term objective is to develop improved measures; that is what Craig Moore's talk addressed, improved measures of readiness and sustainability. But there is also the short-term concern that issues will arise during

the next POM, which requires thinking about what measures should be used until improved methods are developed. Most people in the community agree that SORTS is not adequate for making decisions at the OSD level, but what are the alternatives? There may be a short-term agenda that addresses how to make do with what exists but in a more clever way.

The need for a general framework for cost-effectiveness was discussed extensively, and one presumably is being developed that will be helpful to DoD. Hopes for a methodology that will be commonly accepted by all parties, however, are perhaps optimistic. If there are to be big changes in the size of the active force especially, and perhaps in the reserves as well, then there must be questions about how the infrastructure will change. What other costs will change? Partly, that is a prediction problem: if DoD does X, what *will* happen to the rest of the force? Partly, it is a question of what *should* happen to the rest of the force. There is a natural reaction to protect structure, even if it's not combat force structure. No one wants to give up resources. But there are many organizations whose size doesn't directly vary with the number of units they are supervising, and so there is a question of how much those will change and how much they should change. This is not a question that a common costing methodology would answer; it is a question of actual empirical evidence.

An organizational issue is the challenge of connecting the disparate parts of DoD to ensure that balanced decisions are made. This issue, however, may not be one a research organization can be successful in solving. The example of the Marine Corps planning for one war and its Navy support planning for another is an extreme illustration of that disconnect. Someone must be in charge of looking at plans *across* Services and judging them, and there must be a methodology for doing that.

Another research theme was, given the kinds of force capability modeling tools currently used or coming into use, how can those tools and models be made to do a better job of capturing the strengths and limitations of reserve units? In addition, most models do not adequately incorporate combat service support units, which are heavily concentrated in the Army Reserve.

Other issues identified as needing additional research included: the IRR, where there is a great amount of residual skill that can be used more; compensation of military personnel, since compensation is a large part of the equation in reserve issues; and the recruiting base for the reserves, specifically the feasibility of setting up new reserve units.

BIBLIOGRAPHY

- Gotz, Glenn A., Michael G. Shanley, Robert A. Butler, and Barry Fishman, *Estimating the Costs of Changes in the Active/Reserve Balance*, RAND, R-3748-PA&E/FMP/JCS, September 1990.
- Gould, Phillip, et al., *Planning Conventional Forces*, Institute for Defense Analyses, R-295, April 1986.
- Hammon, Colin, and Stanley Horowitz, *Flying Hours and Air Crew Performance*, Institute for Defense Analyses, P-2379, forthcoming.
- Horowitz, Stanley, et al., *The Analytic Treatment of Reserve Policy Issues*, Institute for Defense Analyses, P-2122, February 1990.
- Moore, S. Craig, et al., *Concepts for Enhancing and Integrating the Measurement of U.S. Military Readiness and Sustainability*, RAND, R-3842-DAG, 1991.
- Palmer, Adele R., and C. Peter Rydell, *An Integrative Modeling Approach for Managing the Total Defense Labor Force*, RAND, R-3756-OSD/AF, December 1989.
- Palmer, Adele R., and David J. Osbaldeston, *Incremental Costs of Military and Civilian Manpower in the Military Services*, RAND, N-2677-FMP, July 1988.
- Schank, John F., Susan J. Bodilly, and Michael G. Shanley, *Cost Element Handbook for Estimating Active and Reserve Costs*, RAND, R-3748/1-PA&E/FMP/JCS, September 1990.
- Simms, Edward D., Jr., Dayton Pickett, and Donald W. Srull, *Needed: A Strategy for the Technical Training of Reservists*, Logistics Management Institute, Report RA503R1, October 1987.
- Simms, Edward D., Jr., Donald W. Srull, Wayne D'Ambrosio, F. Ronald Frola, John P. Thomas, Jr., *Total Force Composition: Improving the Force-Mix Management Process*, Logistics Management Institute, Report ML316, February 1984.

Appendix A

AGENDA

RAND
2100 M Street, N.W.
Washington, D.C. 20037

COLLOQUIUM ON TOTAL FORCE MANAGEMENT September 27–28, 1989

AGENDA

Wednesday, September 27

- 0800 Continental breakfast
- 0845 *Welcome and Organization of the Colloquium*
Michael Rich, Vice President, National Security Research, RAND
Glenn Gotz, Director, Defense Manpower Research Center, RAND
- 0900 *Total Force Policy: The Proposed Directive*
Karen Alderman, Director, Productivity and Civilian Requirements
Office, OASD Force Management and Personnel
- 0930 *Contemporary Reserve Force Issues*
Brigadier General Carl Morin, DASD Readiness and Training,
OASD Reserve Affairs
- 1015 Panel: Overview of Total Force Management Objectives
Total Force Composition—Improving the Force-Mix Management Process
Don Srull, Logistics Management Institute
The Analytic Treatment of Reserve Policy Issues
Stanley Horowitz, Institute for Defense Analyses
Developing Cost-Effectiveness Guidelines for Total Force Management
Adele Palmer, RAND
- 1200 Lunch
- 1315 Panel: Assessing Readiness
Enhancing the Measurement of U.S. Military Readiness and Sustainability
Craig Moore, RAND

- Operational Training and the Performance of Combat Units*
Glenn Gotz, RAND
Flying Hours and Operational Performance
Stanley Horowitz, Institute for Defense Analyses
1500 *Forces Readiness and Manpower Information System (FORMIS)*
Colin Halvorson, Logistics Management Institute

Thursday, September 28

- 0800 Continental breakfast
0830 Panel: Reserve Training and Readiness
Reserve Readiness Issues
David Grissmer, RAND
Training Readiness of Army Combat Service Support Units
John Metzko, Institute for Defense Analysis
Needed: A Strategy for the Technical Training of Reservists
Edward Simms, Logistics Management Institute
1045 Panel: Estimating Costs
The IDA Defense Planning Model
Phil Gould, Institute for Defense Analysis
RAND's Research on Estimating the Costs of Total Force Mix Decisions
Glenn Gotz, RAND
Analyzing Active/Reserve Transfers
Lane Pierrot, Congressional Budget Office
1200 Lunch
1315 Continuation of Panel on Estimating Costs
1400 *Linking National Security Objectives and Total Force Management*
David Chu, ASD Program Analysis and Evaluation
1430 *Discussion Groups*
Linking defense strategy to total force composition decisions
Research to assist implementation of total force policy
Capability assessment tools—What needs to be done?
1545 *Discussion Group Reports*
1630 *Summary Comments on Research Needs by OSD and FFRDC Representatives and Open Discussion*
1700 Adjourn

Appendix B

LIST OF ATTENDEES

Ms. Karen Alderman
Office, Assistant Secretary of Defense
for Force Management and Personnel

Mr. Richard M. Allen
Office, Assistant Secretary of Defense
for Force Management and Personnel

Mr. Robert Bartholomew III
Office, Assistant Secretary of the Army
(Manpower and Reserve Affairs)

Lt. Cdr. Daniel S. Beach
Office, Assistant Secretary of Defense for
Program Analysis and Evaluation

Captain David Bellamy
National Defense University
Washington, D.C. 20319-6000

Mr. Richard E. Brockman
U.S. Army Force Integration Support Agency
Fort Belvoir, VA 22060-5587

Mr. Albert D. Brown
Department of the Army
U.S. Army Force Integration Support Agency
Fort Belvoir, VA 22060-5587

Dr. Robert M. Brown
RAND

Mr. Junior H. Burkhead
Office, Assistant Secretary of Defense for Reserve Affairs

Mr. Lewis Cabe
Center for Naval Analyses
4401 Ford Ave.
Alexandria, VA 22302-0268

Lt. Col. William Carr (USA)
Office, Assistant Secretary of Defense
for Force Management and Personnel

Col. John C. Cartland, Jr.
Headquarters, Dept. of the Army
DAPE-MB

Col. Michael R. Cathey
Office, Assistant Secretary of the Navy for Manpower
and Reserve Affairs

Dr. David Chu
Assistant Secretary of Defense for Program
Analysis and Evaluation

Mr. Albert V. Conte
Deputy Assistant Secretary of Defense for
Manpower and Personnel
Office, Asst. Secretary of Defense for Reserve Affairs

Lt. Col. William Derrick
Headquarters, U.S. Air Force (DPXA)

Cdr. Allen A. Ferber
Joint Staff, J-5

Col. Edward Fitzsimmons
Office, Assistant Secretary of Defense for
Force Management and Personnel

Ms. Dorothy Fontenot
U.S. Army
Force Integration Support Agency
Attn: MOFI-PME
Fort Belvoir, VA 22060-5587

Captain John B. Godley
Office, Assistant Secretary of Defense for Reserve Affairs

Dr. Glenn A. Gotz
RAND

Dr. Philip Gould
Institute for Defense Analyses
1801 N. Beauregard St.
Alexandria, VA 22311

Dr. David Grissmer
RAND

Mr. John S. Guthrie
Office, Assistant Secretary of Defense for
Reserve Affairs

Mr. Colvin Halvorson
Logistics Management Institute
6400 Goldboro Road
Bethesda, MD 20817-5886

Captain Michael J. Harris
Office, Assistant Secretary of Defense for
Force Management and Personnel

Mr. Stan Horowitz
Institute for Defense Analyses
1801 N. Beauregard St.
Alexandria, VA 22311

Col. William E. Jones
HQ, USAF
AF/XOXF

Captain William J. Keating (USN)
Office, Assistant Secretary of Defense for
Force Management and Personnel

Col. James Kiehle
7504 Timber Ridge Court
Fort Worth, TX 76179

Commander John M. Kirby
Naval War College
NSDM Department
Newport, RI 02841-5010

Col. Clifford R. Krieger
Joint Staff, J-5
Strategy Division

Dr. Larry Lacy
Office, Assistant Secretary of Defense for
Force Management and Personnel

Lt. Col. Lee F. Lange, Jr.
Headquarters, U.S. Marine Corps
Attn: MPP-40

Mr. William H. Lewis
Office, Assistant Secretary of Defense for
Force Management and Personnel

Mr. Daniel R. Lowe
Navy Manpower Analysis Center
Norfolk, VA 23511-6697

Ms. Susan L. Marquis
Office, Assistant Secretary of Defense for
Program Analysis and Evaluation

Mr. James Marsh
Assistant Deputy Chief of Staff for Manpower
and Reserve Affairs
Headquarters, United States Marine Corps

Dr. S. Craig Moore
RAND

Brig. Gen. Carl R. Morin
Deputy Assistant Secretary of Defense for
Readiness and Training
Office, Assistant Secretary of Defense for
Reserve Affairs

Dr. Adele R. Palmer
RAND

Mr. Dayton Pickett
Logistics Management Institute
6400 Goldboro Rd.
Bethesda, MD 20817-5886

Ms. Lane Pierrot
Congressional Budget Office
House Annex Building 2
2nd and D Streets, SW
Washington, D.C. 20515

Mr. Herbert Puschek
Office, Assistant Secretary of Defense for
Program Analysis and Evaluation

Ms. Aline Quester
Center for Naval Analyses
4401 Ford Avenue
Alexandria, VA

Lt. Col. Carl A. Rea
Department of the Army
U.S. Army Force Integration Support Agency
Fort Belvoir, VA 22060-5587

Ms. Audrey J. Reeg
Office, Assistant Secretary of Defense
for Force Management and Personnel

Col. David Rice
Office, Assistant Secretary of Defense for
Reserve Affairs

Mr. Michael Rich
RAND

Brigadier General Robert B. Rosenkranz
Director of Force Programs Integration
Office of the Army Deputy Chief of Staff for
Operations and Plans
Headquarters, Department of the Army

Mr. Frank Rush
Office, Assistant Secretary of Defense for Reserve Affairs

Mr. Michael Shoecraft
Navy Personnel Research and Development Center
San Diego, CA

Lt. Col. Dave Showers
PRP-ANG
Headquarters, USAF

Colonel D. Sibley
Office, Chief of the Air Force Reserve
Programs and Resources Division (AF/REXP)

Dr. G. Thomas Sicilia
Director
Training Data and Analysis Center
3280 Progress Drive
Orlando, FL 32826

Mr. Edward Simms
Logistics Management Institute
6400 Goldboro Rd.
Bethesda, MD 20817-5886

Dr. Neil M. Singer
Congressional Budget Office
House Annex Building 2
2nd and D Streets, SW
Washington, D.C. 20515

Mr. Wayne R. Spruell
Office, Assistant Secretary of Defense for Reserve Affairs

Mr. Donald Srull
Logistics Management Institute
6400 Goldboro Rd.
Bethesda, MD 20817-5886

Lt. Col. K. J. Strafer
Office, Assistant Secretary of Defense for
Force Management and Personnel

Mr. John Tilson
Institute for Defense Analyses
1801 N. Beauregard St.
Alexandria, VA 22311

Lt. Col. Craig S. Vossekuil (USMC)
Joint Staff, J-8

Mr. Paul Wilke
Office, Deputy Under Secretary of Defense (Planning and Resources)

Lt. Col. Lawrence Wilkins
Office, Deputy Chief of Staff for Plans and Operations
Force Readiness Division (DAMO-ODR)
Headquarters, Department of the Army

Lt. Col. Winfield S. Wilson
DAMO-FDF
Headquarters, Department of the Army

Mr. Christopher Wright
Office, Assistant Secretary of Defense for Program
Analysis and Evaluation
Force Structure Analysis Division

